hp-ux/usr

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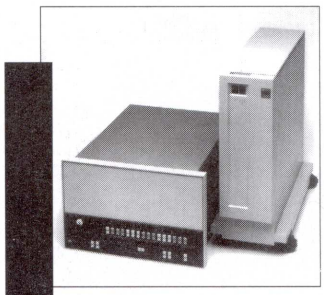

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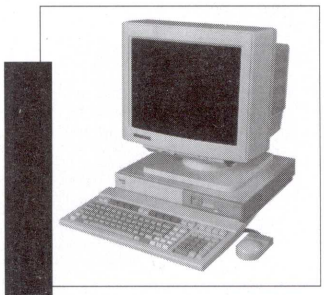

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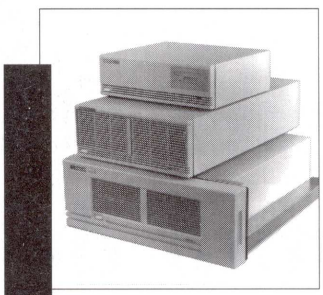

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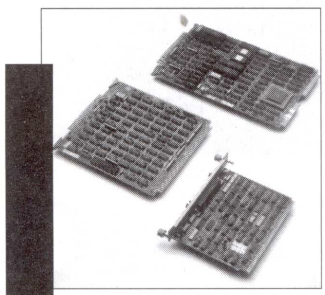

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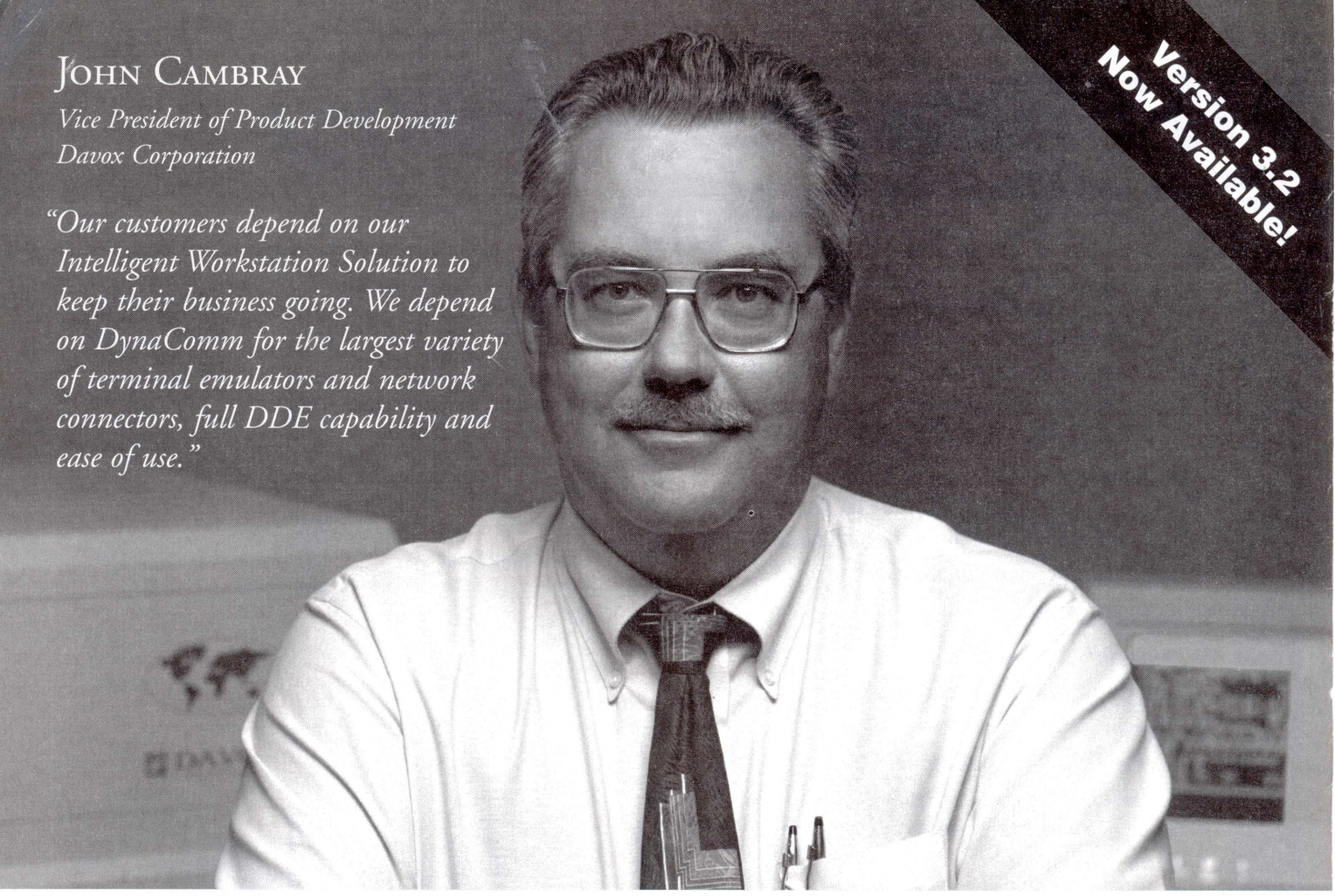

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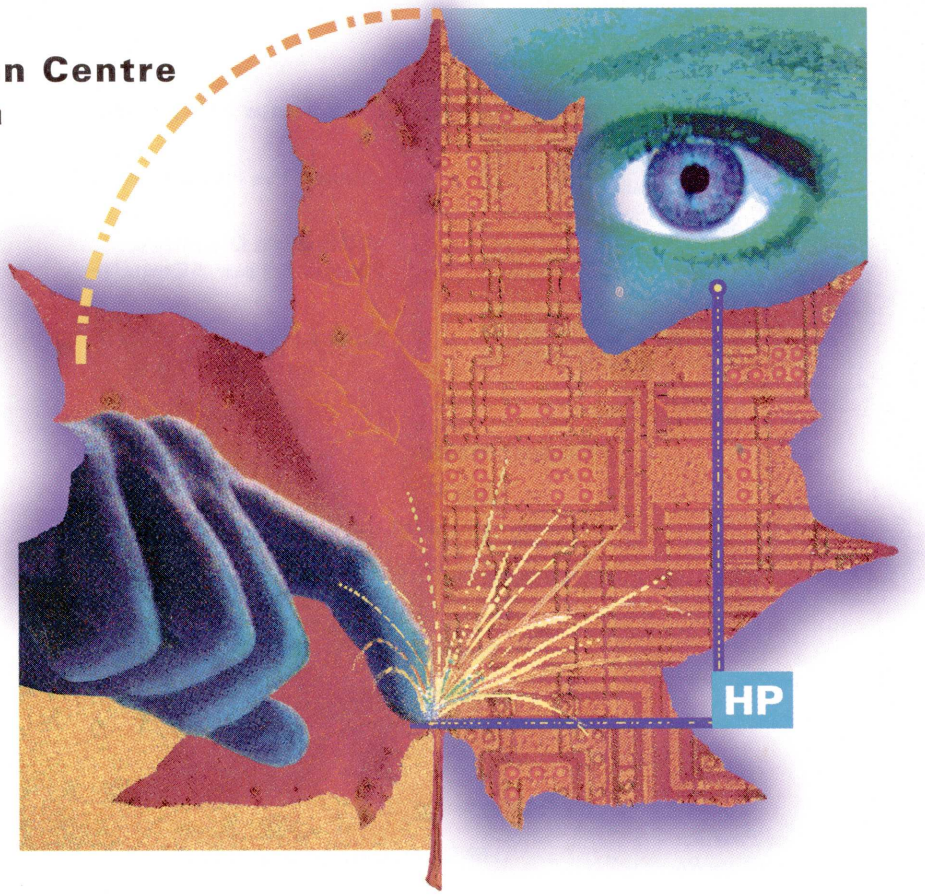

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Volume 3, Number 2 March 1995

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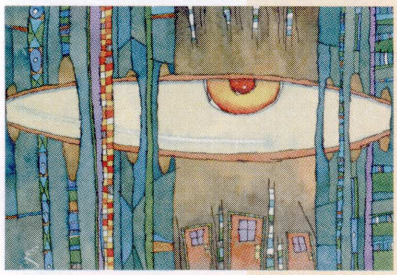

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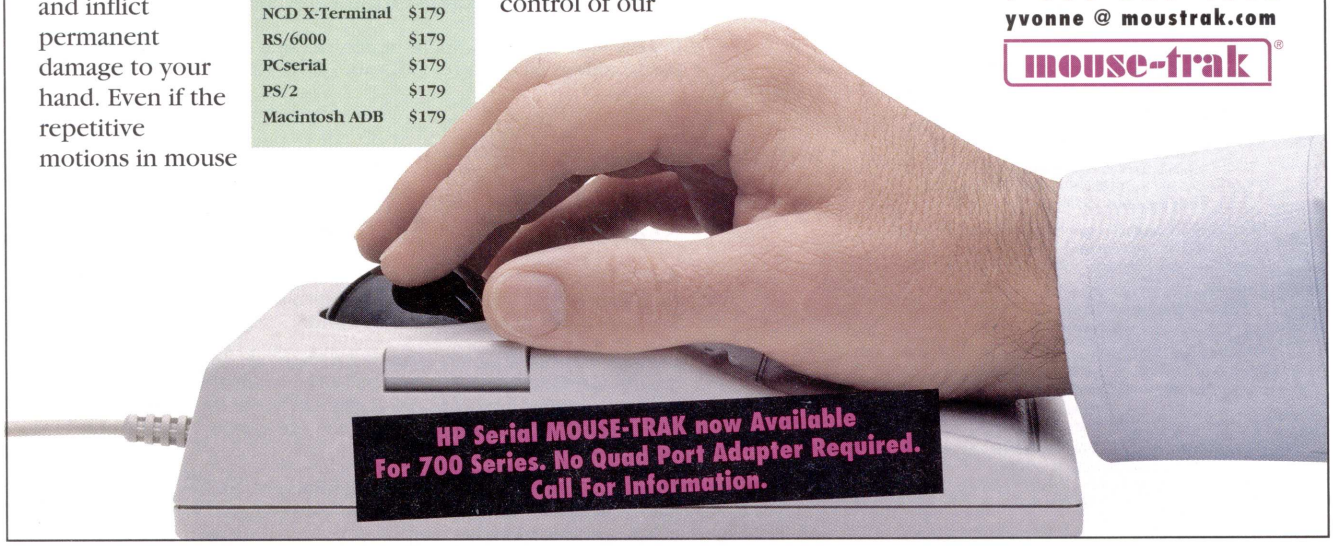

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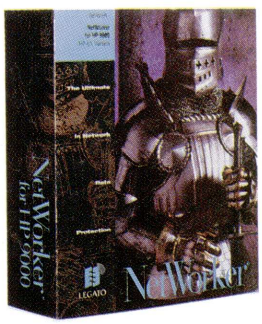

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CIRCLE 136 ON READER SERVICE CARD

Question & Answer

Q: I have users who don't handle their JetDirect printing very carefully and the printer ends up with a bunch of unprinted pages. Is there a way to kill a job or to restrict access?

A: Yes and Yes. The JetDirect software (current version C.02.17) has a command to kill the current connection, regardless of where it originated. To kill the connection, you must configure the printer with a SET community name (there is no default SET name). This is done when you first set up the printer for BOOTP... The options are in the SNMP section.

If you already specified some SNMP values, you don't need to remove and reenter the BOOTP setting; just edit the file */usr/tftpdir/hpnp/<printer>.cfg* and add the line:

set-community-name: whatever

whatever is the password needed to do something to the JetDirect connection (such as kill it or force the card to reboot). Once this change is made, you'll have to power cycle the printer to force a reboot to download the new information. Once the connection is killed, you may need to remove the paper tray(s) to stop the printer from printing all the pages still left in memory. Then press the RESET button and hold it for 5 seconds until 07 RESET appears, or cycle power on the printer once the paper stops coming out.

To control access to the printer, the same file may be used to restrict access via TCP/IP connections. The entry in the *tftpdir/hpnp* file is:

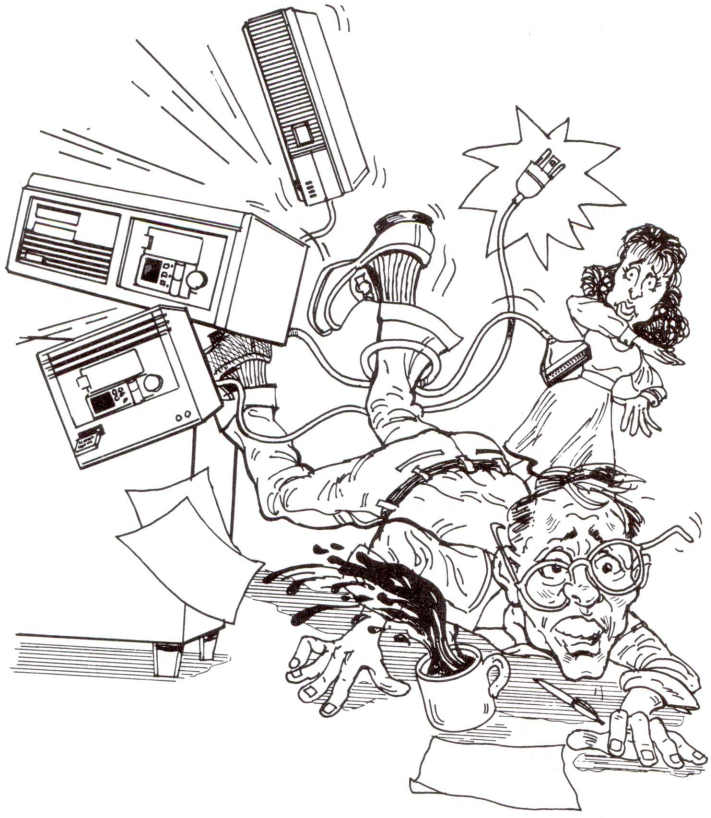
allow: 15.16.17.18 255.255.248.0

The first number is the IP address of the computer allowed to send jobs to this printer, and the second (optional) is the subnet mask appropriate for this computer. Generally the second number is not required, but if supplied, it should be correct for that network.

The *allow:* command may be repeated up to 10 times for different hosts that are allowed access to this printer. Hosts that are not allowed access will have an error message listed in */usr/spool/lp/log*.

Q: I have several system managers for my computer who occasionally change the kernel. Is there any method to determine if the currently running kernel in memory is based on the */hp-ux* file on disk?

A: The command *ipcs* will use nlist to decode locations in memory given data that is contained in the */hp-ux* file. If anything is changed in the */hp-ux* file, the locations won't point to the right memory addresses and *ipcs* won't report anything.



It was UGLY.

Joe bit it when he tripped over a mess of SCSI and power cables (12 stitches). Two days ago, he disconnected the server from the network (4 hours downtime). Last week, he was taking apart a tape drive he thought was bad when his screwdriver slipped and hit the power supply (fried drive, power out for two hours). Stacy tried to help him out and called the vendor to get a replacement for the fried drive, only to find out it would be two days before one could be shipped (2 days without backup).

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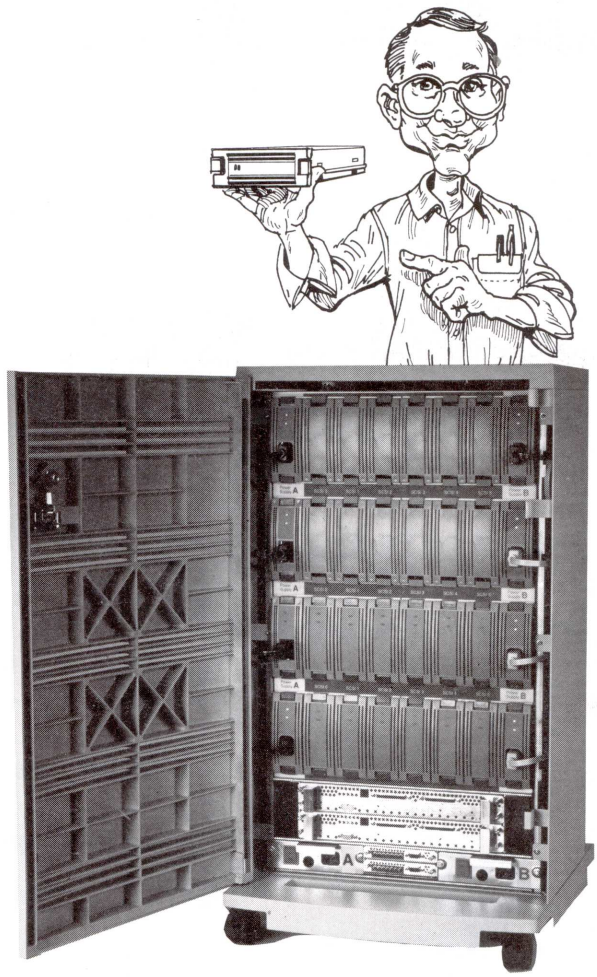
Since there are no loose cables to trip over, Joe listens to his Walkman and dances around the lab freely with no fear of stitches or disconnecting the network. If a device goes down, Joe just slides it out of its slot and replaces it with another. He has retired his screwdrivers to the toolbox -- far away from the lab.



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Here's an example of a normal *ipcs* report:

```
IPC status from /dev/kmem as of Thu Jan  6 19:44:48 1995
T     ID     KEY        MODE       OWNER    GROUP
Message Queues:
q      0 0x3c441f85 -Rrw--w--w-      root     root
q      1 0x3e441f85 --rw-r--r--      root     root
Shared Memory:
m      0 0x41441f5b --rw-rw-rw-      root     root
m      1 0x41441fb5 --rw-rw-rw-      root     root
m      2 0x41442eb0 --rw-rw-rw-      root     root
m  14603 0x43740f0b --rw-rw-rw-    daemon   daemon
m   7204 0x00000000 D-rw-rw-rw-    daemon   daemon
m  25205 0x00000000 D-rw-rw-rw-    daemon   daemon
Semaphores:
s      0 0x41441fb5 --ra-ra-ra-      root     root
s      1 0x41442eb0 --ra-ra-ra-      root     root
s      2 0x00446f6d --ra-r--r--      root     root
s      3 0x01090522 --ra-r--r--      root     root
```

On a machine not running */hp-ux*, *ipcs* doesn't find valid data and only shows:

```
IPC status from /dev/kmem as of Thu Jan  6 19:44:48 1994
T     ID     KEY        MODE       OWNER    GROUP
Message Queues:
Shared Memory:
Semaphores:
```

To script this test:

```
ipcs | sed '/^[^msq]/d' | wc -l
```

which strips out all non-data lines (lines that don't start with m, s, or q) and simply counts if any lines are present. *ipcs()* also allows you to specify another *nlist()* file, so

```
ipcs -N /SYSBCKUP | sed '/^[^msq]/d' | wc -l
```

will try to match data using the symbol table from */SYSBCKUP* instead of from */hp-ux*.

Q: Sometimes I've had problems with booting up on my Series 800 computer with errors like:

disk1(4.0.0;0x4) bad magic; ERRNO=16

What happened and how do I fix it?

A: This means that the *AUTO* file tried to load */hp-ux* from section 0x4. If you are using disk sections (not LVM) to boot, you need to specify the correct disk section as in:

```
ISL > hpux disc1(4.0.0;13)
```

To see what the current *AUTO* file contains, use the ISL command: *lsa* (or the long form: *listautofl*) and it will report what the *AUTO* file contains. You can fix the command very easily with:

```
ISL > hpux set autofile (;6) "hpux (;13)"
```

The (;6) refers to section 6 where the LIF area (and the *AUTO* file) is contained. The text in quote marks is the desired *AUTO* file contents. The man page hpux_800 has details on these commands.

Q: I need a way to test whether or not a variable in a script is set. I've tried a few things but I want to make sure that the variable actually contains something other than null or spaces.

A: At first appearance, something like:

```
set +u
if [ -z "$myvar" ]; then ...stuff... fi
```

The -z test will be true if *myvar* is not set or if *$myvar* is null (no value). However, if *$myvar* is whitespace, -z will be false.

Another method of performing string tests with ksh is to use double square brackets. Using this method you don't need the " " around *$myvar*. The question about how to catch null strings or whitespace should work with a test of a pattern that matches zero or more occurrences of whitespace.

```
if [[ $myvar = *([   ]) ]]
then
   print TRUE
else
   print FALSE
fi
```

Note that the [ ] is actually: square bracket, space tab, square bracket. Now the routine will return TRUE if:

myvar is undefined
myvar is a NULL string
myvar is a string with only blanks or tabs or any combination

Q: How do I compute the *dump(1)* command tape lengths for DDS drives?

A: *dump(1)* was written a *long* time ago and only for 1/2-inch magtapes that had standard recording densities and inter-record gaps. Today's DDS drives have much more sophisticated data handling and recording techniques and *dump* cannot be rewritten to handle these features without sacraficing compatibility. However, you can assume a record length of 16k and approximately 500kbytes/inch recording density. So for 60-meter tapes (which is about 200 ft), use:

```
dump bds 16 500000 200
```

or for 90 meter tapes (300 ft),

```
dump bds 16 500000 300
```

Data compression is almost impossible to predict until after the data has been written, but you can start with 2:1 as a common compression value.

With *dump(1)*, you will not have access to high-speed retrieval methods for DDS tapes such as those found in *frecover* and HP's OmniBack software.

Q: I need a list of alternate superblocks, but I did not save them when I ran *newfs*. How can I regenerate them?

A: The algorithm that *mkfs* (or *newfs*) uses is described in

the header file */usr/include/sys/fs.h*:

```
( fpg * c ) + ( cgoffset * ( c & ~cgmask )) + sblkno
```

where

c	=	the cylinder group number
fpg	=	fragments per cylinder group (nsect * ntrak * cpg) / (frag_size / 1K) nsect and ntrak can usualy be found in the */etc/disktab* entry cpg defaults to 16
cgoffset	=	cylinder group offset, nsect is rounded to the next higher multiple of the block size in KB / fragment size in Kb
cgmask	=	a binary mask value with the high order bits set and the low order bits clear such that value of ntrak will be masked
sblkno	=	16 (unless you have the block size set to some other size...use that block size)

Q: Is there a way to check for the presence of a tape in my drive?

A: Here's a quick way:

```
mt -t /dev/rmt/0m rew
if [ $? -ne 0 ]
then
   echo " No tape present"
else
   echo "Tape is ready"
fi
```

If you want to unload the current tape, use `mt -t /dev/rmt/0m` off line. This works on SCSI tape drives but not on HP-IB drives, which do not have a media unload capability through the computer.

Q: I need to run a very large program that may require 1500 megabytes in the data area. How can I do this on my 700 workstation?

A: By default, a process's 4-GB address space is divided into four equal quadrants of 1 gigabyte each. Each quadrant has a specific purpose (text, data, etc.) and this accounts for the limitation on maxdsiz of ~960 megabytes.

The manual *How HP-UX Works: Concepts for the System Administrator* (Manual Part No. B2355-90029) gives a picture of what the process address space will look like.

Beginning with HP-UX Release 9.01, the Series 700 workstations allow you to define an EXEC_MAGIC executable whose maximum data size can exceed one gigabyte. The *Concepts* manual explains this as follows :

> On the Series 700, an EXEC_MAGIC user executable (a.out) format allows data to start immediately after the code area in the first quadrant, instead of at the beginning of the second quadrant, and grow to the beginning of the user stack. Executables created with this format can handle more than 1 GB of data; refer to ld(1) in the *HP-UX Reference Manual* for information.

A process's address space in EXEC_MAGIC format is depicted in *Figure 1*. Notice the key is that our data space now starts in the first quadrant right after the process text and runs through the second quadrant. The data space cannot take the full two gigabytes but rather about 1.9 gigabytes. The ~1.9-GB limit represents the area from 0x00000000 to 0x7b033000. As you see, the remainder is used for the stacks and U-Area.

Again this is done only for EXEC_MAGIC executables. For SHARED_MAGIC, the data will begin at 0x40000000. Everything else will remain at the same location and the maximum stack size is still 80 MB. To

Continued on Page 14

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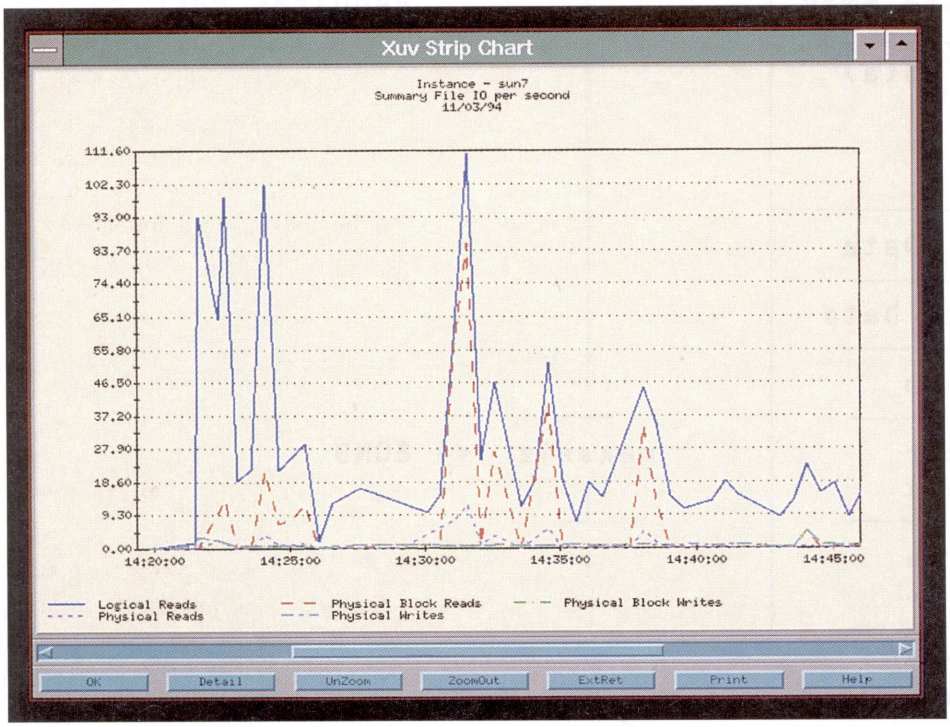

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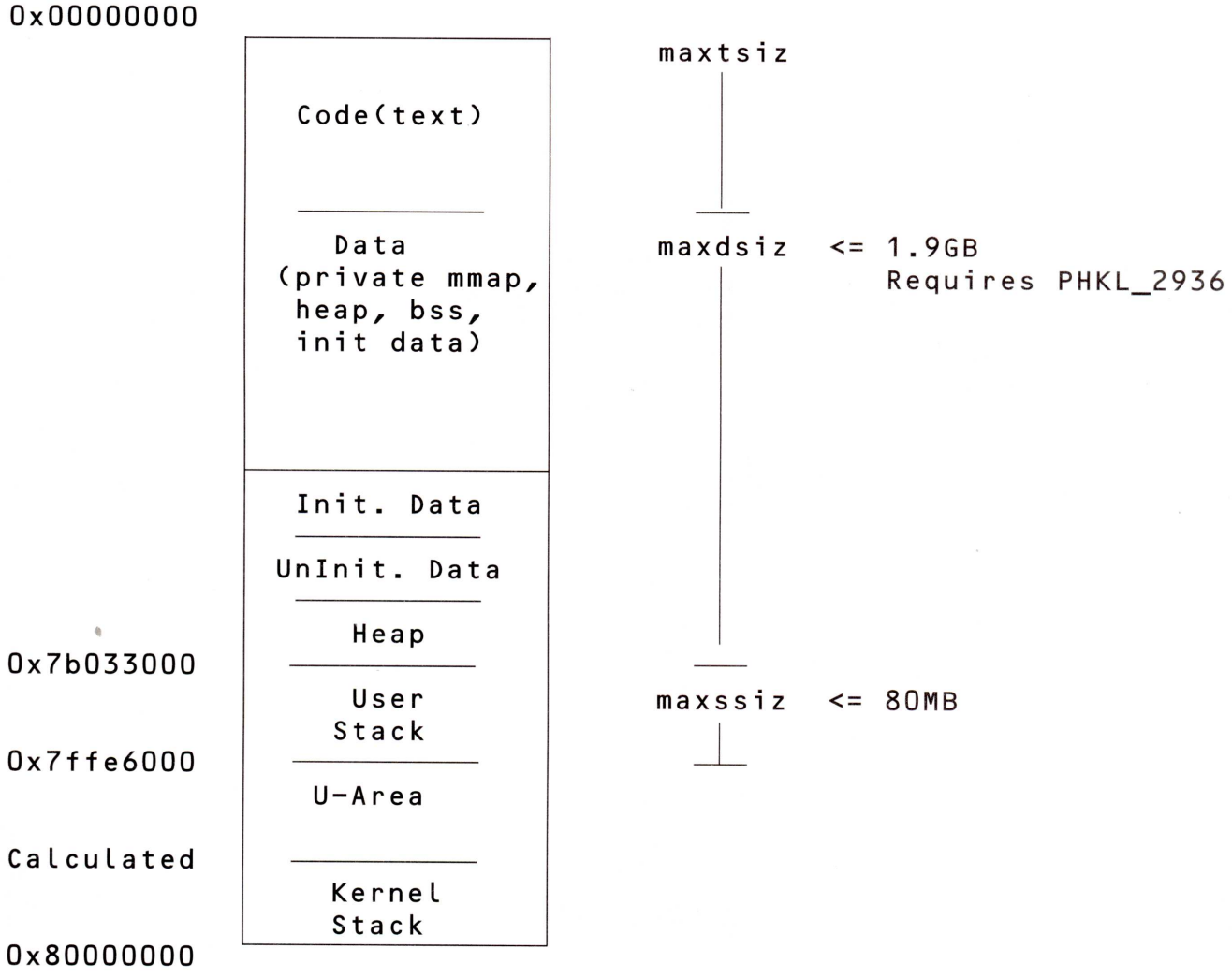
CIRCLE 44 ON READER SERVICE CARD

FIGURE 1 *Process Address Space*



create an executable in EXEC_MAGIC format requires that it be linked with the -N option. Refer to the *ld(1)* man page for more details. Also, a patch is required on 9.01 to remove a restriction on maxdsiz that still limits the data to ~960 MB.

There is a negative impact from the use of EXEC_MAGIC. Since the text and data share the first and second quadrants, and data must be private, both quadrants now have to be marked private. This means that the program's text is no longer sharable. Each process will have its own copy of the text loaded. It would not be desirable to create a large number of such unshared executables because they place a huge demand on memory.

If you have an existing program that you have no source for or do not wish to recompile/link as EXEC_MAGIC, the process will remain with a limit of ~960 MB for its data size.

General HP-UX and 9000 questions are answered by Bill Hassell, a support engineer at the HP Atlanta Response Center. He can be contacted via e-mail at blh@hpuerca.atl.hp.com.

Continued on Page 16

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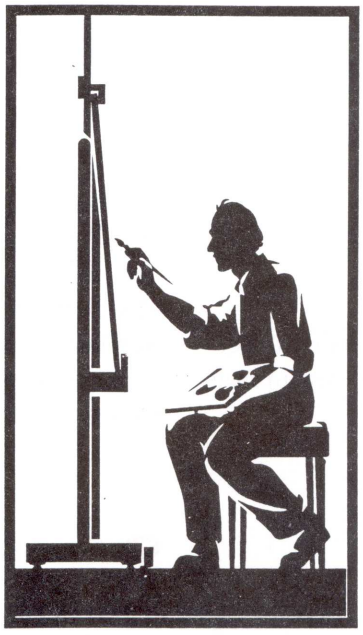

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Workstations

Q: I am using HP FAX 9000 on my 9000 Series 715 workstation. The 715 is a stand-alone FAX 9000 server. I have several users who log in remotely and use the HP FAX 9000 through the command line interface. I would like to know how to turn off e-mail confirmation for those FAX 9000 users who do not want e-mail confirmation that the fax was sent and who do not have access to the FAX 9000 GUI.

A: In their home directories have the users edit their *$HOME/.faxrc* file and change the fax.sendConf line to read as follows:

```
fax.sendConf: False
```

Q: I have an HP 9000 Series 712/80 workstation running HP-UX 9.03. The HP 712/80 comes equipped with audio. I am using an executable in the */usr/audio/bin* directory called *send_sound* and would like to know how to direct the audio sound from the internal speaker to the external jacks on the rear of the machine where I have installed external speakers.

A: To redirect the audio output from the internal speakers to the external ports on your 712 you will need to set the SPEAKER environment variable as follows:

Bourne Shell & Korn Shell

```
export SPEAKER=external
```

C Shell

```
setenv SPEAKER external
```

This information is covered in the *Audio(5)* man page.

Q: Is there a way to edit faxed images that my HP fax solution receives? I run HP MPOWER 2.02 on an HP 9000 Series 735 running HP-UX 9.05. MPOWER uses the HP FAX 9000 as the fax facility. I need to be able to edit forms that are faxed to me and then fax the edited forms back to the person who sent them. Is this possible through HP MPOWER and FAX 9000 ?

A: Yes; to edit a fax image received through FAX 9000, bring up the fax in question through the FAX 9000 browser window. Highlight the desired fax and press the **View Fax...** button. This will bring up the fax viewer window. From the **Fax - View** window select the **Add Text** button and this will bring up the **Add Text** window. Enter the desired changes in this window and select the **Place Text** button and move the mouse pointer to the location on the form you would like the text placed.

Q: I run VEETEST Version B.00.01 on an HP 9000 Series 735 running HP-UX 9.03. I am having problems accessing the serial interfaces on the 735 from HP VEETEST. I am using Direct I/O objects and I have verified the baud rate setting and other configuration criteria are correct for my serial device. I set the Direct I/O object through the **I/O -> Configure I/O** menu pick in the VEETEST window. When I try using the Direct I/O object, I get an error pop-up that complains that it cannot find serial9. Have I missed a configuration point ?

A: Yes, I believe that your system is not configured correctly. HP VEETEST B.00.01 on the Series 700 machines uses *termio(7)*, as one might expect, to control the serial interface. However, VEETEST configures the port through the SICL (Standard Instrument Control Library) */usr/pil/etc/hwconfig.cf* file. The last entries in the *hwconfig.cf* should reference the serial interfaces. *Figure 2* shows a *hwconfig.cf* file with the serial9 configuration line uncommented.

Notice the second line from the bottom of the file that references *# RS-232 'A' Port (on s700's)*. After uncommenting the line that references the serial port, run the command */usr/pil/bin/pilconf*. This will make a */dev/serial9* device file and correctly configure VEETEST to use port A on your 735. A word of WARNING: *pilconf* will build a new kernel and reboot your system.

Continued on Page 20

FIGURE 2 *hwconfig.cf File*

```
#
# Hardware Configuration File
#
#
# Each line in this file corresponds to an interface card that will be used
# by the PIL kernel driver for instrument I/O.  There is one and only one
# line per interface card.

# The format of each line is as follows:
#
#    <lu> <symname> <cardname> <location> <card_addr> ...card specific values...
#
#
# Where:
#   <lu>          - Logical unit number of the card (0<lu<10000).  Each
#                   interface card must have a unique logical unit number.
#                   The actual value used is not important, but you must
#                   remember this number in order to properly address the
#                   card in your application.
#  <symname>      - A symbolic name for your card.  Each card must have
#                   a unique symbolic name.  This name may be used instead
#                   of the logical unit number to address an interface.  The
#                   default symbolic name for your first HP-IB card should
#                   be "hpib".  Possible values for additional HP-IB cards
#                   include (but aren't limited to): "hpib2", "xhpib", etc.
#  <location>     - The location of the card.  For EISA/ISA cards, this is
#                   the slot number.  For DIO cards, it is the select code.
#                   For s700 internal cards, this field should always be
#                   0 (not used).
#  <cardaddr>     - For HPIB, this is the bus address of this card.  For
#                   VXI, this is the logical address of this card.  For
#                   RS-232, this field should always be 0 (not used).
#
#  card specific information is described below for each possible card.
#  In each case, the values specified are numbers and may be represented
#  in either hexadecimal (using 0x...), octal (using 0...), binary
#  (using 0b...), or decimal (default).
```

FIGURE 2 *hwconfig.cf File, continued*

```
#
#
# Cards located on this system:
#
#
# HP E2070A Card (ISA HP-IB Interface Card):
#       <lu> <symname> e2070a <slot_num> <hpib_busaddr> <dip_switch>
#    where:
#       <slot_num>     - EISA/ISA slot number.
#       <hpib_busaddr> - HP-IB Bus address of this card.
#       <dip_switch>   - The value of the DIP switch setting for this E2070A
#                        interface card.  See the installation manual for
#                        information on how to code this value.
# Default HP-IB Card
7       hpib  e2070a 1 21 0b01110000  1 # Card in first slot  (Slot #1)
# Uncomment the following lines for the 2nd thru 4th card:
# Note that only slots (1,3) or (1,4) or (2,4) are allowed combinations,
# since two HP-IB cards cannot sit in two consecutive slots (mechanical
# mounting won't work).
#7    hpib e2070a 2 21 0b01100100   1 # Card in second slot (Slot #2)
#8    hpib2 e2070a 3 21 0b01011000  1 # Card in third slot  (Slot #3)
#8    hpib2 e2070a 4 21 0b01001100  1 # Card in fourth slot (Slot #4)
#
# HP s700 Interal RS-232 cards
#       <lu> <symname> int232 0 0 <port_number>
#    where:
#       <port_number>  - Either 1 (for the RS-232 'A' port) or 2 (for the
#                        RS-232 'B' port).
#    0 0               - Required.
#
9    serial int232 0 0 1     # RS-232 'A' Port (on s700's).
#10  serial2 int232 0 0 2    # RS-232 'B' Port (on s700's).
```

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There is one other possibility that could cause your problem. If you have installed a newer version of the SICL libraries, the *hwconfig* file may not contain the correct entries for VEETEST B.00.01. SICL 3.X and above reference the serial ports in a different fashion. This newer method allows control of the interfaces directly through SICL instead of *termio(7)*. Future releases of VEETEST will use this method to control the serial interfaces, but the B.00.01 release and below use the *termio(7)* function. Shown below is an example of the new *hwconfig.cf* serial entries:

```
#
#  The serial drivers specify the following defaults:
#  baud: 300 1200 2400 4800 9600 19200
#  parity: NONE  0x00
#          ODD   0x08
#          EVEN  0x18
#          ZERO  0x38
#          ONE   0x28
#  cbits: 7  0x02
#         8  0x03
#  sbits: 1  0x00
#         2  0x04
#  flow: NONE      0x00
#        XON_XOFF  0x01
#        RTS_CTS   0x02
#        DTR_DSR   0x03
#  SRQ: RI   0x00
#       DSR  0x01
#
# Example:
# 9 serial serial700 0xf0823000 26 <baud> <parity> <cbits>
#                                        <sbits> <flow> <SRQ>
#
# 9  COM1 serial700 0xf0823000 26 9600 0x00 0x03 0x00 0x00 0x00
# 10 COM2 serial700 0xf0822000 25 9600 0x00 0x03 0x00 0x00 0x00
```

When the 9 COM1 line is uncommented in the example above, the interface is lost to the operating system as a *termio(7)* resource and dedicated to the SICL library. To get around this, simply ensure the newer references to the serial lines are commented out and add a line to reference the interface as in the older example as follows:

```
9       serial int232 0 0 1      # RS-232 'A' Port (on s700's).
```

Q: I just bought a new HP 9000 Series 745i and BASIC/UX 7.01. I have had a HP 9000 Series 382 running BASIC/UX 6.3 for some time now. My problem is that when I moved the BASIC/UX code from the 382 to the 745i the program runs about three times slower on the 745i. I have looked through the manuals to see if I have something configured wrong, but cannot find any reason for the slower operation. Should the 745i run the BASIC/UX code slower?

A: No; however, we have recently seen problems with BASIC/UX 7.01 on Series 700 machines where a program that uses I/O will execute much slower than normal. This has been traced to the use of shared libraries with SICL and BASIC/UX. The reason is a permissions problem with the shared libraries supplied with SICL and BASIC/UX 7.01. The libraries were shipped with write permission set, which causes the libraries to be rechecked by the operating system each time they are accessed by the program. This extra checking to ensure the libraries have not changed is causing slower program execution. To correct this behavior you will need to change the permission to *555* on all the SICL libraries. You will need to do this to */usr/lib/libsicl.sl* and all the *.sl* files in the */usr/pil/lib* directory. ◧

HP 9000 workstation questions are answered by Rudy Stanley, an applications support engineer with the Hewlett-Packard Response Center in Atlanta, Georgia. He can be reached at brst@hpuerca.atl.hp.com.

HP 1000 Guru

Q: I have my own RTE-A Driver written for a custom I/O card. This was written many years ago on an A600 processor. I now find that this same driver does not work correctly on the A990 processor. It appears to be a timing problem. Is the speed of the A990 versus the A600 causing my problem?

A: When writing I/O drivers, it is often necessary to set up a timing loop while waiting for an interface card to acknowledge receipt of the last command. Typically, if the loop is exited before the card acknowledges receipt of the command, the driver then sets an error condition alerting the calling program that an error has occurred. Most often, timing loops fall into one of two categories: those that fall through the loop based only on the number of iterations through the loop, and those that wait for the flag flip flop on the I/O card to be set (or cleared). Typically the latter type will also have a counter associated with the loop to prevent waiting for the flag forever. Here are some examples:

Example 1:

```
lda count
isz a
jmp *-1
... continue
```

Example 2:

```
lda count
ina,sza,rss
jmp error
sfs card      skip if flag set
jmp *-3
... continue
```

In the first case, the driver writer has determined that a certain amount of time must elapse before proceeding beyond the loop. The length of time is determined by the value of *count* and the execution times for the *isz* and *jmp* instructions. The execution times are CPU-dependent so, usually, the driver designer will set up *count* based on the CPUID or on the worst-case scenario (i.e., set *count* large enough so that even on the fastest A-Series—previously the A900—enough time will elapse before proceeding). Since the A990 is now much faster than the A900, these types of loops may fail if *count* is not adjusted.

In the second case, the driver is waiting for the flag to be set. The driver writer has determined that there is an error if the flag has not been set in *count* iterations through the loop. The value of *count* again is dependent on the CPUID and the instruction execution times. In addition, the behavior of the I/O card is understood such that the driver writer knows the maximum time the card will need to set the flag. Based on that information, the value of *count* can be determined. In an effort to minimize the effects of moving drivers from other A-Series CPUs to the A990, the timing has been changed for the Skip if Flag Set (*SFS*) and Skip if Flag Clear (*SFC*) instructions. This is not only because the A990 has a faster CPU cycle time than the A900, but also because the behavior of the instructions has been modified.

Let's describe the timing of the *SFC* and *SFC* instructions on the A900 first. The *SFC* instruction decides whether or not to skip based on the value of the flag. If the instruction decides to skip, then the skip is taken, and the next instruction is fetched immediately. If the instruction decides not to skip, a check is made to see if the currently executing instruction has the same opcode as the previous *SFS* instruction. If this is true, the machine waits an extra amount of time

before fetching the next instruction. The reason for this behavior is that if the previous *SFS* instruction has the same opcode as the current *SFS*, then there is a good chance that the computer is in a "skip flag set" loop, waiting for some I/O process (DMA, for example) to be completed. The skip on flag microcode runs so fast that it would keep the I/O backplane too busy with I/O instruction broadcasts, instead of letting much DMA traffic occur. Therefore, the microcode slows itself down to free up more bandwidth on the I/O backplane.

The *SFC* instruction on the A900 does not have this extra wait, even when the current *SFC* opcode is the same as the previous *SFC* opcode. It was assumed that no programmer would write a loop that used the *SFC* instruction to wait for DMA to finish.

The *SFS* instruction on the A990 has the same behavior as on the A900. That is, if the current *SFS* opcode is the same as the previous *SFS* opcode, an extra amount of waiting is done.

The *SFC* instruction on the A990 now includes the same extra wait as the *SFS* instruction. Again, the extra wait only occurs if the skip is not taken, and the current skip flag opcode is the same as the previous flag. The amount of time the instruction waits was calculated so that the entire time spent in the "SFS loop" is as close as possible to that spent on an A900. The desired effect is to minimize the number of changes to drivers when moving from previous A-Series processors to an A990.

Here is a table to help clarify matters:

	A900	**A990**
SFS, skip not taken	If same opcode, wait extra time	If same opcode, wait extra time
SFS, skip taken	Don't wait	Don't wait
SFC, skip not taken	Don't wait	If same opcode, wait extra time
SFC, skip taken	Don't wait	Don't wait

Q: I am trying to install the LP Spooler on my 6.1 ARPA/1000 system. I get undefined externals when linking RLPOUT and RLPDAEMON.

I checked the .lod files, and have referenced the networking libraries. Am I missing something?

A: Yes, you are missing the Berkeley Sockets Library, which is required for linking RLPOUT and RLPDAEMON. Unfortunately, the BSD_CDS.lib library is not included with ARPA/1000. If you have the NS-ARPA/1000 product, then you can use the BSD_CDS library from there.

In the future, the BSD library may be included with the ARPA/1000 product. In the meantime, if you want to use the LP Spooler with remote HP-UX machines, you can obtain the BSD library from the Response Center. This will enable you to link RLPOUT and RLPDAEMON.

Q: For several years I have been experiencing a problem with the RS program. It consistently fails with a RUNTIME ERROR 601. This problem has persisted over several different system updates. The program itself has been compared to a functioning copy on another system (The load maps are identical). What else should I be looking for?

A: Problems that affect a particular system and that recur over several revisions certainly indicate a problem that is *unique* to the *system* in question. So what is unique to a particular system? Well, certainly the location and system manager are unique. Another uniqueness is the hardware itself. In this particular case, the solution was discovered almost accidentally in the SYSTEM generation ANSWER FILE. The RTE-A Generator program is very forgiving and will not always report an error when in fact an INCORRECT sequence of commands is given.

The problem in this answer file was a missing "END" statement in the System Messages section of System Common.

```
re,/TE_A/%msgtb
end
re,/RTE_A/%$m000
end       <---------This END was missing
re,/VCPLUS/security.rel
end
end
```

Regenning with the correction solved the problem of RS aborting with RUNTIME ERROR 601.

Sometimes a close examination of the system answer file, and comparing it to the sample supplied with RTE-A, may be the only way to find the problem. ◧

HP 1000 Guru questions are answered by Walt Boeninger. He is a support engineer at the Mountain View Response Center and has been supporting the HP 1000 for 15 years.

File transfer protocol—*ftp*— is one of the standard ways to transfer files between two computers in a TCP/IP, UNIX environment. Input to ftp includes the name of the remote host that you wish to contact, the user's name under which you log on, and the user's password. Once access has been obtained, you can download (or upload) one or many files according to the permission settings on the directories and files you wish to access.

Anonymous ftp, as the method is called, refers to logging into a remote computer using the ftp service with the user name "anonymous." This is not a real user name that is part of your system but rather a name that ftp knows about and deals with in a special manner. By allowing virtually anyone to log into a system, it provides for a general file retrieval service.

I will not go into setting up an anonymous ftp server (see the O'Reilly book, *Practical UNIX Security*, by Garfinkel and Spafford, pp. 245-246) but rather will concentrate

ANONYMOUS

by Joe Berry

Illustration by Matt Foster

on how to use an anonymous ftp server for retrieving some of the "goodies" mentioned in the Internet Goodies column (this issue, p. 64). A variety of interesting files that can be downloaded are discussed there. The important question is: How do you actually download a file?

Looking carefully at the column, you will note that in the section headed **alt.sources**, I do not give any indication of where the software is located. When the software in alt.sources is first posted, it is actually part of the post. If you saved it, you have it. If you didn't, you'll have to find it. Finding this software will require a little bit of work. I'll discuss this later.

Software referenced in the column under **comp.sources.misc** is identified as being posted as a "volume, issue" pair of numbers. This, too, will be discussed later. For the other software, a computer site and pathname/filename combination specify where the software can be retrieved. This is what we will now discuss by way of an example.

Site and Pathname/Filename

Under the **Miscellaneous** heading, I mentioned that someone had posted a copy of the Berkeley printer subsystem that had been ported to Solaris 5.3. Let's assume you would like this software (with the hopes of porting it to HP-UX). The software is located at *ftp.nus.sg*. Ordinarily, it is not recommended that you access ftp sites outside North America since typically the transmission speed is slower. However, it did not appear that the software had been distributed to more local sites (although, truthfully, I did not check).

To connect to this site in Singapore, enter the command

```
ftp ftp.nus.sg
```

This is what happened when I did that.

```
wayne>
wayne>ftp ftp.nus.sg
Connected to ftpserver.nus.sg.
220 ftpserver FTP server (Version wu-2.4(1)
                          Fri Apr 15 09:34:58 WST 1994)ready.
Name (ftp.nus.sg:joe): anonymous
331 Guest login ok, send your complete e-mail address as password.
Password:
```

Note that although it wasn't echoed, I entered *joe@unix.landmark.com* as my password. I was then rewarded with the following banner information.

```
230-+-----------------------------------------------------------------------+
230-|    Welcome to the National University of Singapore's FTP Server.      |
230-|                              (ftp.nus.sg.)                            |
230-|                            ********************                       |
230-|                                                                       |
230-| We now have 16 GB of disk space on the server now.                    |
230-|                                                                       |
230-| Use ->ftp.nus.sg<- for your FTP needs first, before going on the      |
230-| Internet. IT WILL BE FASTER.                                          |
```

FTP ACCESS

```
230-|                                                                    |
230-| We have mirrored popular PC/Mac/UNIX/etc archives. Move to the ~/pub  |
230-| directory and look at the ARCHIVES.TXT file.                       |
230-+--------------------------------------------------------------------+
230-
230-
230 Guest login ok, access restrictions apply.
```

We need to `cd` to the correct directory. This is a proper ftp command:

```
ftp> cd /pub/NUS/ISCS/misc
250 CWD command successful.
```

At any time, you can enter `dir` to get an `ls -l` listing of the contents of the directory. In almost all cases you should then enter the command `binary` to tell ftp that you want subsequent files transmitted as binary files and not as ASCII files. If you do not know the type of file you have, enter `binary` because all files can be transferred correctly as binary files but not all files can be transferred correctly as ASCII files.

```
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 1104
-r--r--r--  1 root     system     351375 Mar  8  1994 lpr-port-2.tar.z
-r--r--r--  1 root     system     152796 Feb 25  1994 lpr-sol2-p1.tar.gz
-r--r--r--  1 root     system     152566 May 11 03:09 lpr-sol2-p2.tar.gz
-r--r--r--  1 root     system     153437 Aug 25 02:40 lpr-sol2-p3.tar.gz
-r--r--r--  1 root     system     263957 Feb 25  1994 lpr-sol2.tar.Z 226
Transfer complete.
ftp> binary
200 Type set to I.
```

Note that the file we are interested in appears above in the `dir` listing output. To get the file, use the `get` command. The file will be placed in your current directory (where you were when you issued the `ftp` command).

```
ftp> get lpr-sol2-p3.tar.gz
200 PORT command successful.
150 Opening BINARY mode data connection for lpr-sol2-p3.tar.gz (153437 bytes).
226 Transfer complete.
153437 bytes received in 95.94 seconds (1.562 Kbytes/s)
ftp> quit
da221 Goodbye.
```

And now you have the file. You might get an error message saying you do not have sufficient permission. If the permission bits on the file you are accessing seem to indicate that all should be well, the problem may be that you were in a non-writable directory when starting ftp. You can quickly fix this problem without terminating your connection to the remote computer by using the `lcd` command (local change directory). You would enter

```
lcd /tmp
```

for example, and try doing the `get` again.

Once you have the file, you must "unzip" it (note the 'gz' suffix in the file name). To do this, enter the command

```
gzip -d lpr-sol2-p3.tar.gz
```

The next step is to untar the file and follow the README file's instructions (assuming there is a README file or some other source of instructions). But what if you are really just starting the adventure of getting "goodies" from the Internet? What if you don't even have the wonderful utility *gzip*?

In that case, your first step is to obtain the Free Software Foundation program *gzip*. This program is located on many, many ftp servers. One of the more popular locations is *gatekeeper.dec.com* (See? Digital Equipment Corporation does do nice things!). Do a

```
cd /pub/GNU
```

followed by a

```
dir gzip*
```

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The latest version of *gzip* is Version 1.2.4. You will want to execute the command

```
get gzip-1.2.4.tar
```

(after having done a `binary`, of course). It's 798,720 bytes long. Don't get the smaller gzipped version! Once you have the file, untar it, compile, and go.

Be aware that with all the recent interest in the Internet, more and more people are accessing files from all over the world. The following has happened to me on more than one occasion.

```
wayne>ftp ftp.uu.net
Connected to ftp.uu.net.
220 ftp.UU.NET FTP server (Version wu-2.4(1)Thu Apr 14 15:45:10 EDT 1994)ready.
Name (ftp.uu.net:joe): anonymous
530- Sorry, there are too many anonymous users using ftp.UU.NET at
530- this time. There is currently a limit of 85 anonymous users.
530- Please try again later.
530 User anonymous access denied.
Login failed.
ftp> quit
```

Volume/Issue

Let's look at how to access software that was posted to a specific volume and issue. In the Goodies Column, I discuss a program that prints barcodes on HP laser printers. The program can be found in volume 44, issue 51 of *comp.sources.misc*. Our goal now is to find a repository of the Usenet group *comp.sources.misc*. A good candidate is *gatekeeper.dec.com*. We access this ftp server just as we accessed the server in Singapore:

```
wayne>ftp gatekeeper.dec.com
Connected to gatekeeper.dec.com.
220- *** /etc/motd.ftp ***
 Original by: Paul Vixie, 1992
 Last Revised: Richard Schedler, April 1994

 Gatekeeper.DEC.COM is an unsupported service of Digital Corporate Research.
 Use entirely at your own risk - no warranty is expressed or implied.
 Complaints and questions should be sent to <gw-archives@pa.dec.com>.

 EXPORT CONTROL NOTE: Non-U.S. ftp users are required by law to follow U.S.
 export control restrictions, which means that if you see some DES or
 otherwise controlled software here, you should not grab it. Look at the
 file OOREADME-Legal-Rules-Regs (in every directory, more or less) to learn
 more. (If your the treaty between your country and the United States did
 not require you to respect U.S. export control restrictions, then you would
 not have Internet connectivity to this host. Check with your U.S. embassy
 if you want to verify this.)
 Extended commands available via:
```

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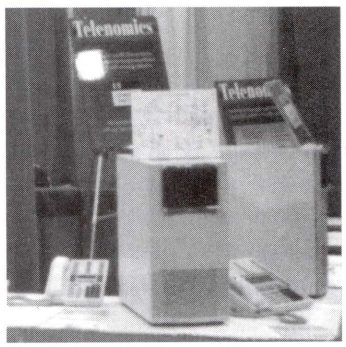

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CIRCLE 21 ON READER SERVICE CARD

```
      quote site exec COMMAND
  Where COMMAND is one of:
      index PATTERN   - to glance through our index (uses agrep).  example:
                        ftp> quote site exec index emacs
      locate STRING   - like "index", but faster and without RE support. ex:
                        ftp> quote site exec locate updatedb

  This FTP server is based on the 4.3BSD-Reno version. Our modified sources
  are in /pub/DEC/gwtools.
 If you are connecting to gatekeeper from a VMS system running a version of
 UCX earlier than V2.0, a bug in UCX will prevent the automatic login from
 working. To get around this, wait for the message that says:
      %UCX-E-FTP_LOGREJ, Login request rejected
 and then log in by hand with the "login" command at the "FTP>" prompt.  You
 should also consider upgrading to the latest version of UCX.

Name (gatekeeper.dec.com:joe): anonymous
331 Guest login ok, send ident as password.
Password:
230 Guest login ok, access restrictions apply.
```

Note the rather verbose greeting. Do read it, though, since it may contain important information about where your prospective files are located.

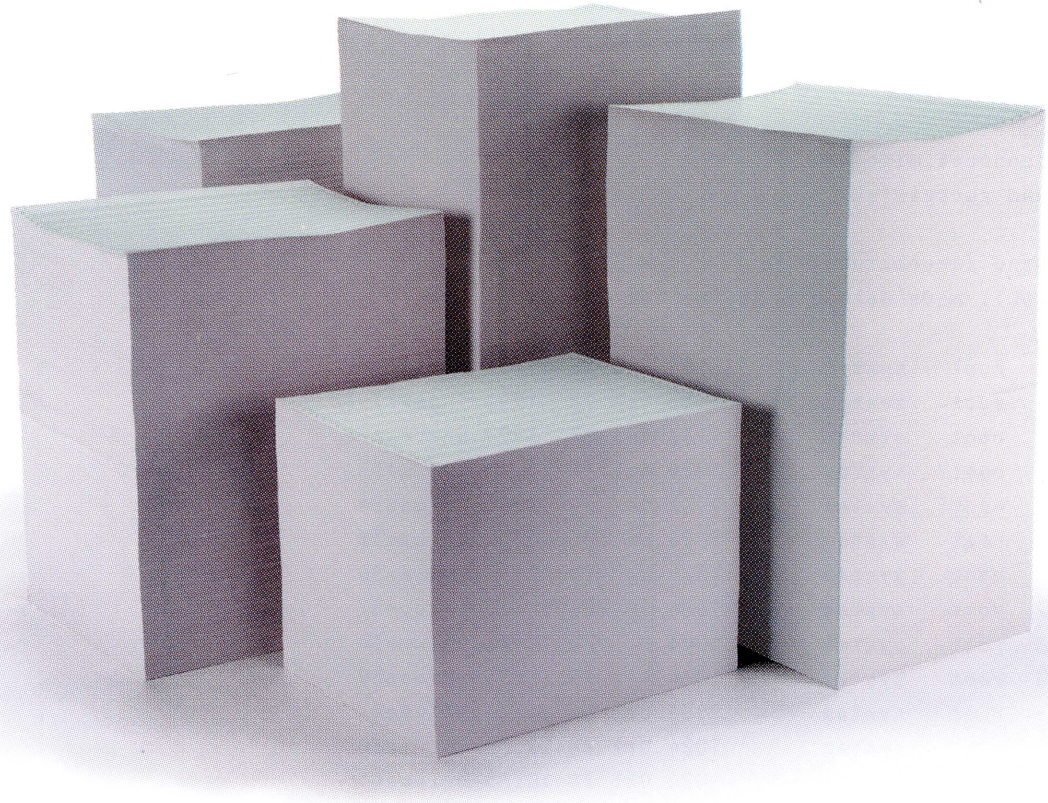
```
ftp> cd pub/usenet
250 CWD command successful.
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 10
lrwxr-xr-x  1 root     system         31 Oct 24 10:45
                    OOREADME-Legal-Rules-Regs -> ../../OOREADME-Legal-Rules-Regs
dr-xr-xr-x 16 root     system        512  Oct  24 10:12  comp.sources.games
dr-xr-xr-x 47 root     system        1024 Oct  24 10:37  comp.sources.misc
dr-xr-xr-x  5 root     system        512  Oct  24 10:37  comp.sources.reviewed
dr-xr-xr-x  7 root     system        512  Oct  24 10:37  comp.sources.sun
dr-xr-xr-x 30 716      system        1024 Oct  24 10:43  comp.sources.unix
dr-xr-xr-x191 root     system        4096 Oct  24 10:45  comp.sources.x
226 Transfer complete.
```

Note the different news groups that are archived here. Obviously we want to

```
cd comp.sources.misc
```

For brevity's sake, I edited out most of the directories that appeared when I did the next `dir`. Note that there is a 'volume44'.

Continued on Page 32



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CIRCLE 102 ON READER SERVICE CARD

```
ftp> cd comp.sources.misc
250 CWD command successful.
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 197
-r--r--r--  1  root   system      63854 Oct 23 15:08 index
-r--r--r--  1  root   system      71383 Sep 12  1993 index.1-20
-r--r--r--  1  root   system       1732 Nov 12  1992 shareware
dr-xr-xr-x 26  root   system       1024 Oct 24 10:31 volume33
dr-xr-xr-x 35  root   system       1024 Oct 24 10:31 volume34
dr-xr-xr-x 34  root   system       1024 Oct 24 10:32 volume35
dr-xr-xr-x 26  root   system       1024 Oct 24 10:32 volume36
dr-xr-xr-x 32  root   system       1024 Oct 24 10:33 volume37
dr-xr-xr-x 33  root   system       1024 Oct 24 10:33 volume38
dr-xr-xr-x 34  root   system       1024 Oct 24 10:34 volume39
dr-xr-xr-x  9  root   system       1536 Oct 24 10:34 volume4
dr-xr-xr-x 36  root   system       1024 Oct 24 10:35 volume40
dr-xr-xr-x 43  root   system       1024 Oct 24 10:35 volume41
dr-xr-xr-x 32  root   system       1024 Oct 24 10:36 volume42
dr-xr-xr-x 32  root   system       1024 Oct 24 10:36 volume43
dr-xr-xr-x 19  root   system       1024 Oct 24 10:36 volume44
dr-xr-xr-x  3  root   system        512 Oct 24 10:36 volume45
226 Transfer complete.
ftp> cd volume44
250 CWD command successful.
```

By doing a `dir` here, we see all the files that became part of volume 44. And there is our *hp-barcode* as a directory. We must then do a

```
cd hp-barcode
```

and see what is there to access.

```
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 223
lrwxr-xr-x  1 root   system      37 Oct 24 10:36 00README-Legal-Rules-Regs ->
                                                 ../../../../00README-Legal-Rules-Regs
dr-xr-xr-x  2 root   system     512 Oct 24 10:36 a32src
dr-xr-xr-x  2 root   system     512 Oct 24 10:36 arg_parse
dr-xr-xr-x  2 root   system     512 Oct 24 10:36 c++2latex
dr-xr-xr-x  2 root   system     512 Oct 24 10:36 cproto
dr-xr-xr-x  2 root   system     512 Oct 24 10:36 dist-3.0
dr-xr-xr-x  2 root   system     512 Oct 24 10:36 dnswalk
dr-xr-xr-x  2 root   system     512 Oct 24 10:36 fcurses
```

```
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 hp-barcode
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 ibpag2
-r--r--r--  1 root    system    27343 Jul 24 21:43 intro44.Z
dr-xr-xr-x  2 root    system     1024 Oct 24 10:36 jpeg
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 mailagent
-r--r--r--  1 root    system    15370 Jul 24 21:44 patchlog44.Z
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 rocat
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 toy_os
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 typhoon
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 unzip
dr-xr-xr-x  2 root    system      512 Oct 24 10:36 va.h
dr-xr-xr-x  2 root    system     1024 Oct 24 10:36 vim
226 Transfer complete.
ftp> cd hp-barcode
250 CWD command successful.
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 5
lrwxr-xr-x  1 root      system          40 Oct 24 10:36
      OOREADME-Legal-Rules-Regs -> ../../../../../OOREADME-Legal-Rules-Regs
-r--r--r--  1 root      system        3931 Sep  5 23:00 part01.Z
226 Transfer complete.
ftp> binary
200 Type set to I.
ftp> get part01.Z
200 PORT command successful.
150 Opening BINARY mode data connection for part01.Z (3931 bytes).
226 Transfer complete.
3931 bytes received in 3.532 seconds (1.087 Kbytes/s)
ftp> quit
221 Goodbye.
wayne>uncompress part01
```

Downloading file *part01.Z* is all that is required to get the *hp-barcode* software. The standard UNIX *uncompress* command is used to expand the file, *part01* (we know to use *uncompress* because the suffix is '.Z'). This will undoubtedly be an ASCII file (with mail headers, as it was originally posted to Usenet that way). Follow the instructions for unpacking the software as they are described in the file and then you will be done.

There are many other commands to ftp. Those that I think you might find useful (at least those that I have found useful) include `hash`, `prompt`, and `mget`. If you enter the comand `hash` before you start the `get`, ftp will display hash marks (the pound symbol) for every 1,024 bytes transmitted (if you are on a fast link, you'll see hash marks for every 8 Kbytes transmitted). This helps to give you a warm, fuzzy feeling seeing that everything is working when you are receiving a large file.

If you want to download a number of files that can be defined with an expression, then you'll want to use `mget`. The `get` command allows you to specify only one file name. For example, enter

```
mget fred*
```

to download all files that start with the letters "fred." ftp will prompt you to confirm the transmission of each file before it begins copying that file. If you wish to bypass this interactive confirmation, simply enter `prompt` before you begin the `mget` operation.

And that is all there is to ftp. Not! If you are in a perverse mood, you might try entering the command `help` to see how many commands we did not discuss. There's almost enough to write a book! ◧

Joe Berry is a senior software developer at Landmark Systems Corporation in Vienna, Virginia. He is one of the authors of Landmark's performance monitor, TMON for UNIX. A former HP 3000 systems specialist for Hewlett-Packard, he has been in the computer industry for more than 20 years. He can be reached at joe@landmark.com.

CLOSING THE HOLES IN HP-UX

Illustration by Courtney Granner

The recent expansion of the information superhighway has given all of us access to more data than ever before. Unfortunately, this opening of the lines of communication has also exposed our own data to the world. Although most of the browsing of our systems is typically harmless curiosity, steps must be taken to guard our most valuable resources. The surest way to protect your system is never to interface with the outside world. This would, however, deny you access to many valuable sources of information. It also does not protect you from tampering by individuals within your local network.

System security is a finely tuned compromise. As a security administrator, your task is to provide all of the tools necessary

by Joe Pennell

for your users to perform their jobs, without allowing them to reconfigure or destroy your system. The ability to grant various levels of access is built into the UNIX operating system. Once these controls have been established, they must then be monitored to ensure that your security scheme is solid.

The files that control the core of the operating system are the responsibility of the systems administrator. Since such files control access to the entire system, the systems administrator must maintain privileges to them. It is possible to automate procedures to confirm the validity of system files, and thereby increase the confidence in your security. The goal of this discussion is to show some of the critical files, and provide methods for their authentication.

Effective operating system security requires cooperation of all who use the system. In order to protect the integrity of your data, each user must understand the responsibility that comes with the assignment of a login. Once this is clear, then the system administrator's task of securing the operating system will be more manageable.

The management of security in a UNIX operating system can be broken into three key components. The first, and perhaps most critical, factor is the prevention of unauthorized system access. If an intrusion does occur, it is important to know about it as soon as possible. Intrusion detection is the second key factor in security management. After a break-in, it is necessary to clean up the system, and verify that no corruption or re-entry points have been left behind. System recovery is the third component of security management.

Intrusion Prevention

The prevention of system intrusions is perhaps one of the most publicized topics today. With the rapid expansion of the information superhighway, information technology managers have the difficult task of gathering all of this data, without exposing their own systems. In order to reach this goal effectively, a security plan should be formulated. This plan should contain a definite strategy on how access should be granted, as well as how any adverse situation should be handled.

Much of the security of a system can be dealt with through a few simple practices. Access for authorized users should be kept to a minimum, and granted on an "as-needed" basis. It is easier to increase the access for a user than it is to remove privileges that were mistakenly granted. Access is controlled by membership in groups in the */etc/group* file and by permissions of files and directories in the file system. System directories, such as */etc* and */bin*, should never be writable by any login other than root. Otherwise, components of the operating system may be removed, or replaced with corrupted versions. The home directory for root should also be included in this list. For the most part, except for */tmp* and */usr/tmp*, a directory created by the operating system install should be modified only by the operating system. User access can also be controlled by the choice of shell that the accounts use. In addition to the Bourne, Korn, and C shells, the rsh and rksh shells are also available under HP-UX. The restricted Bourne and Korn shells perform much like their predecessors, while hiding parts of the operating system from the users.

Since the main philosophy behind the development of UNIX was the sharing of information, it is difficult to take away the operating system without creating adverse effects. This creates some of the problems with security. If a hacker knows what system is being used, then the potential invader will have a better idea of commands to use to attempt to break in. The most common place to start is the */etc/passwd* and */etc/group* files. From these, it is possible to determine what accounts exist, what access they have, and whether passwords have been set. This is a key reason for keeping user access limited, as it can be expected that end users will not be as security conscious as systems administrators.

Through SAM, it is possible to turn on security measures to help protect this vulnerability. One of the important safeguards here is the generation of a shadow password file. The encrypted password string is replaced with an "*" in */etc/passwd*. Therefore, normal functions such as finger will still work, but attempts to crack the password will be thwarted. The real password file is moved under a directory called */.secure*, which is accessible only to root. Since nobody else can read the encrypted password string, they cannot attempt to decode the password through the use of a popular public domain software package known as *Crack*. It is also a good idea to enforce password aging. This is done in the encrypted password field, where a two-character entry is placed after the encrypted string, with a comma acting as the separator. The two characters in the aging string represent the mandatory frequency of password changes and the minimum time that must pass between changes. This measure acts as a deterrent to brute force methods of password breaking.

Another piece of information that may be dangerous to announce is created on the initial system setup. A file named */etc/issue* is generated during the installation of the operating system. *getty* displays this file unless told to do otherwise in */etc/inittab*. The problem with this file is that the initial default is to display the hardware and operating system versions in use, which is valuable information for someone attempting to crack the system. This file should be either emptied or replaced with a message advising of the legal ramifications of an unauthorized access.

When a system is connected to a local area network, another group of files is added to the list of critical system files. The */etc/services* file specifies which Internet services will be available from that particular host. Two more files, */etc/inetd.conf* and */usr/adm/inetd.sec*, control the usage of these services. The *inetd.conf* file specifies which program will be called for a particular service; for example, a telnet request will be serviced by */etc/telnetd*. The usage of these services may be restricted by using the *inetd.conf* file. Here, it is possible to allow or deny usage of a service to a particular host. The Hewlett-Packard default is to allow global access to any service not specified in *inetd.conf*. This also makes */etc/hosts* a critical file if any restrictions have been placed on specific hosts.

Access over TCP may be made easier through the use of *hosts.equiv* and *.rhosts*. When a remote system is listed in */etc/hosts.equiv*, any user common to both systems may use the *remsh*, *rcp*, and *rlogin* commands to access the local system from the remote without being required to provide a password. This functionality is not allowed to any super-user accounts. A *.rhosts* file in a user's home directory performs the same function, but on a "per-user" rather than a system-wide basis. This file may be configured to allow any user from any known host to access the local system as that user through rlogin, without requiring a password. The *remsh* and *rcp* commands would also be operational. Unlike *hosts.equiv*, root may take advantage of the use of a *.rhosts file*. This is a very important reason for making sure that no accounts can write to root's home directory, as it would be dangerous to allow users to create their own *.rhosts* file into the root account. Individuals should be advised to take similar precautions on their home directories.

In addition to software, there are two hardware entry points that should be noted. Unattended terminal sessions are perhaps the largest vulnerability on any system. A login session for the root user should never be left alone. When the authorized person is away from the terminal, the superuser session should at least be put into *lock*. A better idea would be to log out, and re-enter the system when it is again needed. The Korn shell contains the functionality to enforce non-interactive logouts with the use of an environment variable. When TMOUT is set, an unused session will be terminated in the number of seconds determined by this variable. The time-out will be enforced when a port contains no processes other than the shell. Modems are another area of concern. When possible, they should be brought through a terminal server, a router, or some other piece of hardware that is capable of screening out unwanted connections. If a modem is to be connected directly to the serial port or mux strip, then password protection should be used.

Password protection of a modem line is enabled by the creation of two files, */etc/dialups* and */etc/d_passwd*. The first is a list of all ports that have a modem directly attached. An example of this file would be:

```
#Modem port assignments
#
/dev/ttyd0p5        #mux port 5
/dev/ttyd0p6        #mux port 6
/dev/ttyd00         #serial port 0
```

The */etc/d_passwd* file looks similar to the */etc/passwd* file, except that the user names have been replaced by shell program names. An example of this file would look like:

```
/bin/ksh:/48UqDFc.kAFI:0:0:::
/bin/sh:84rOfhjarZcsm:0:0:::
/bin/csh:t4d/m84.095Fg:0:0:::
/usr/bin/keysh:*:0:0:::
/bin/posix/sh:*:0:0:::
```

To create this file, use any editor to add all entries except for the encrypted password string. Then, execute the command

```
passwd -f /etc/d_passwd < shell name >
```

Continued on Page 39

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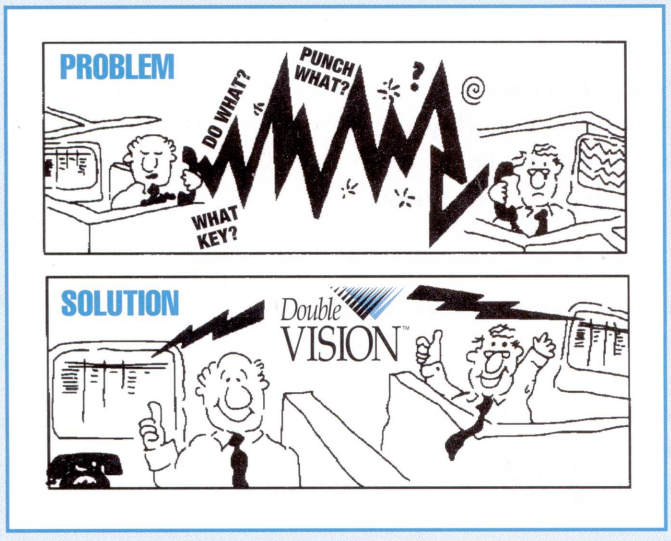

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FIle-Checking Scripts

The four scripts given here work in pairs:

change and *fixconf*
fchng and *fixsum*

The *change* and *fixconf* scripts work as a pair to monitor changes in critical files. Backup copies of each file are kept to decrease recovery time. One file, */root/check*, must be created for this software to operate. The *check* file should contain a list of files that are considered critical.

The *fchng* and *fixsum* scripts also check for modifications in critical files, but they do so by taking a checksum of each file and comparing it against an earlier measurement. The file */root/chkfiles* is used to indicate which files are considered critical.

In both cases, the fix program should be run upon creation of the list of critical files, and again any time that these files are intentionally modified. The *change* and *fchng* scripts should be run on a regular basis, and prior to any modifications of a critical file.

```
#!/bin/ksh
#
#   change:  Checks for changes in files defined in "check".
#            Copies of each file are kept in the /root/config
#            directory. This method takes more space to hold
#            the copies, but provides the most thorough recovery.
#
#  Joe Pennell:  September 1994
#  adapted from the original concept of fchange.sh by Steve Isaacson
#  published in SysAdmin  May/June 1993
   clear
### Special consideration is given to /etc/passwd, as the encrypted
### string and gecos are user modified and may cause a false alarm
   cat /etc/passwd | awk -F: '{print $1":"$3":"$4":"$6":"$7}' > /tmp/pwshort

### Look through each file in "check" for changes
   for file in `cat check`
   do
      cfile=/root/config/`echo $file |awk -F/ '{print $NF}'`
      if { diff $file $cfile > /dev/null; }
      then
        continue          ### Files match
      else
### If a change was made, print out the differences
        echo "$file has been changed"
        echo "The following lines were added:"
        diff $file $cfile |grep \< |cut -c3
        echo
```

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for each shell listed. Any shells that should never be used over the modem lines (such as */usr/bin/keysh* and */bin/posix/sh*) can be denied by adding a * to the encrypted password string field. Any shell not listed in this file is assumed to be unprotected. In this example */bin/rsh* and */bin/rksh* would not require a password. With this functionality enabled, the modem users will see two password prompts. Once a normal login sequence has been successfully completed, the operating system will then detect a protected shell being run on one of the listed ports. This will generate a challenge for another password, at which time the password for the shell is given. This method will allow at least a degree of filtering on modem access, but it should be remembered that it is secure only if the password distribution is kept to a minimum.

More than anything, securing a UNIX operating system requires a modification to regular daily habits. If you want to make sure that your system is not subject to intrusion, then make sure that your data is restricted to the users that you intended it for. A little extra care in checking permissions, and cleaning up behind yourself, will go a long way towards securing your system.

Intrusion Detection

No matter how much time and effort you invest in securing your file system, it is never safe to assume that it is totally impenetrable. It is vital to perform periodic checks for intrusion. Early detection is important to damage control. The big question is how to determine when your file system has been breached.

First, always know who is on your system, where they are connecting from, and

what they are doing. The commands `who -u` and `w` show everyone who is currently logged in, and the IP address that they have connected through. The latter also indicates the current command being executed by each user. Periodic use of these will give you a general idea of what is occurring on your system. Anything that seems to be out of place may be further examined by using the `ps` command. With this utility, it is possible to track all activity to a particular port or user. The use of *vi* on one of the determined system files should be questioned. Viewing the */etc/passwd* file should also be of possible concern. Another method of activity tracking is made available when you are using the Korn shell. Each user has a *.sh_history* file in his or her home directory, which serves as a record of the commands they have executed. The one drawback to this method of tracking is that the file, in order to be used, must be modifiable by the user. If it is known that this file is in use, it may be edited to cover activities.

An intrusion into the system is often brief and may not be detected during the incident. However, anyone who manages to break in will be likely to leave a reentry point for future use. This is where the system files become critical. An intrusion may often be detected by changes in such areas as the password file, a root *.rhosts* file, or SUID programs. Management of these files may help maintain system security, as well as provide for recovery in the event of tampering. The most effective way to provide for this is to create a backup copy of your critical files in a safe place, such as a hidden directory or on removable media, if possible. Intrusion detection is performed by comparing the contents of the live system file to the backup you have saved. Some differences may appear, such as the encrypted password string for a user who has recently changed passwords. But, most of the data should remain constant. The drawback to maintaining the full set of files is the space that is required.

Another good way to verify the integrity of the system files is to create a file with the *sum* of each system file. For */etc/passwd*, it will be necessary to create an intermediate file with the encrypted passwd and the gecos stripped out before performing a checksum. This will help eliminate the inconsistencies created by modifications that users are allowed to make. The checksum method will give a reasonable level of confidence that the information is correct, and requires less space than maintaining a second copy of all files. However, it does not provide the recoverability the first method offers.

SUID programs are another source of concern when securing a system. Some programs must execute a root, and therefore have a permission string that resembles `r-sr-xr-x` when an `ls -l` is performed on the file. When checking the file system, it is important to make sure that no such file owned by root is writable by anyone other than root. The `find` command has the options of *-perm* and *-user*, which can be used to help find such programs. It might also be advisable to maintain a list of known SUID programs, and look for any that cannot be identified. If a system has been breached by a local user, this would be the easiest way for that individual to obtain root access at any time.

One example of how this may be used is for a user to make a copy of */bin/ksh* in his own home directory. Once he has breached the root account, he may change the ownership of this file to root, with the permissions allowing SUID execution. Thus, anytime he accesses the special version of ksh, he calls a Korn shell with superuser privileges.

The */usr/adm* directory also contains several useful tools for system monitoring. The *sulog* file shows all user attempts to execute su to become another user. Each entry contains the original user, the user that was switched to, and a record of whether the switch was successful or not (indicated by a + for yes, or a - for no). This directory also has a *shutdownlog* file, which holds a complete record of all known halts, reboots, and panics. The only activity that cannot be recorded is the powering off of a live system. This is important because a system is vulnerable during the power-up sequence. If someone has the ability to shut your system down and to reach the console on the power-up, then he may secure superuser privileges by interrupting the boot sequence and bringing the system up in single user mode. The shutdown log is the place to start searching if this activity is suspected. The */etc/shutdown.allow* file may also provide a clue, since membership in this file is required to perform a normal shutdown.

Another highly useful file in the */usr/adm* directory is *syslog*. This file contains a complete listing of all system notices, warnings and errors since the last reboot. It also holds information on all TCP connections that have been made. Any session (rlogin, telnet, ftp, etc.), is recorded in *syslog* with a unique identification. Thus, that session can be traced for activity. This may be especially useful for determining which files were transferred by an ftp.

System Recovery

Once an intrusion has been detected, the number one question will be how

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```
        echo "The following lines were removed:"
        diff $file $cfile |grep \> |cut -c3
        echo "************************************************"
        echo
        echo
       fi
    done
    exit 0

#!/bin/ksh
#
#  fchng:   Utility to monitor file changes
#           This utility keeps track of file checksums
#           in /root/confiles.
#           for the files defined in /root/chkfiles.
#           Output is then stored in /root/chgfile.
#           This is a very basic script, which only tells
#           if a file was changed, not what was done to it.
#
#  Joe Pennell : September 1994
#  adapted from the original concept of fchange.sh by Steve Isaacson
#  published in SysAdmin May/June 1993
#
   rm -f /root/chgfile

### Special accommodations are made for the passwd file because
### gecos and the encrypted password string can change
   cat /etc/passwd |awk -F: '{print $1":"$3":"$4":"$6":"$7 }'  > /root/passwd.sum
   for FILE in `cat /root/chkfiles`
   do
      if [ "`sum $FILE`" != "`grep $FILE /root/confiles`" ]
      then
          echo "$FILE has been changed" >> /root/chgfile
      fi
   done

###  If /root/chgfile exists, then there was at least one file changed.
###  Mail the /root/chgfile to alert administrators.

   if [ -f /root/chgfile ]
   then
```

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```
        cat /root/chgfile | mail root   ### Other accounts
                                         ###may be used here.
   fi
   exit 0
#!/bin/ksh
#
#   fixconf:  updates mirrored files for use with "change"
#
#   Joe Pennell,  September 1994
#   adapted from fchange.sh by Steve Isaacson :
#   SysAdmin May/June 1993

    cat /etc/passwd |awk -F: '{print $1":"$3":"$4":"$6":"$7}' > /tmp/pwshort
    for FILE in `cat check`
    do
       cp $FILE /root/config
    done
exit 0

#!/bin/ksh
#
# fixsum: Update checksum entries for critical system files
#
#

RDIR=/usr/accts/jpennell/sh/fchg
rm -f /$RDIR/confiles

### Set up modified passwd file /root/passwd.sum; which excludes
### gecos and encrypted password strings

cat /etc/passwd |awk -F: '{print $1":"$3":"$4":"$6":"$7}' > /root/passwd.sum

for C_FILE in `cat $RDIR/chkfiles`
do
   if [ -f $C_FILE ]
   then
        sum $C_FILE >> /$RDIR/confiles
   fi
done
exit 0
```

to return the system to a normal state. This process will be very much dependent upon the amount of corruption that occurred before your visitor was noticed. This is where a plan of action becomes important. The first step is to make sure that the intruder is gone. If not, take whatever measures are necessary to eliminate the threat. Next, change the root password for your system. It is possible that either your password was broken, or that the intruder changed it to see if you would catch this. Then, begin a sweep of the system in search of other re-entry points, such as *.rhosts* files and SUID programs. Once you believe that your system is secured, you should follow the logs to determine how the entry was made. The files noted in the previous sections should be able to be combined to form a picture of the intruder's login session. From here, you may be able to determine who this user was, and take appropriate action. If not, you may at least come away with useful information on how your system was breached, so that you can protect against such an attack in the future.

Once this information has been gathered, you must then determine what recovery steps are necessary. This will require a verification of your specific application data, to ensure that corruption has not occurred. If data corruption is found, you may wish to restore your system to the last set of successful backups prior to the detection of the intrusion. For a more thorough install, you may even want to reinstall the operating system, and then restore your data from backups. This will help remove any undetected "backdoors" that may have been left behind. This is the most critical case for a recovery.

Most normal recoveries will require the removal of tampering from system files. If you have chosen the method of maintaining a complete set of system files for intrusion detection, then your recovery is simply to copy the known good files into place. If the checksum method was used, then you will want to read through all of your system files to ensure that they are correct. Once all repairs have been made, the checksum file should be updated, since one extra space in the file will change the checksum.

Conclusion

The most important part of system security is the amount of importance and consideration that it is given. Your operating system will be only as secure as the users allow it to be. This is a project that will require compliance by all who are granted access. Otherwise, your efforts will produce results that are not as effective as you desire.

For the systems administrator, security is an ongoing process. Monitoring does not necessarily need to be a constant process, but it should be done frequently. As much as we would like to think that our systems will never be breached, we should be prepared for this event to occur. Despite all efforts to thwart intruders, it must be recognized that intrusion is a possibility. The goal is to be able to recover from an adverse situation, while minimizing any known points of exposure. ◧

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Illustration by Christine Benjamin

UNIX Boot Disasters:

Planning Your Alternatives

Most of the time, we don't think about the complexities of booting an HP 9000. It just always works, time after time. But if you are a typical system administrator, you worry about the unexpected. It's your job to plan for the worst, and to know how to deal with it.

What are you going to do on the day your HP 9000 fails to boot? This article will discuss the possibilities that are available. Your choice will depend on what went wrong with the normal boot.

Here are some faults that make a boot fail, and what we can do:

- Bad/missing kernel file—use a different kernel.
- Bad/missing programs, scripts, or configuration files on the root disk drive—use different boot options.
- Fatal error in boot area or file system—use a different boot device.

The above faults are all similar in that they are matters of data that is not correct on the disk. The methodology of the fix is always to gain access to the disk, then rewrite or correct the data, or at least back up critical files. This article assumes that the fault is not in hardware. When hardware may be the cause, this methodology will give us ample opportunity to observe what works and what doesn't, see hardware error messages that occur, and make a clear diagnosis of the real fault. At that point we detour out of this methodology until the hardware is fixed.

Bad or Missing Kernel File

The kernel is a file in the root directory, called */hp-ux* by convention. It is assumed that an alternate kernel will always be present in a file called */SYSBCKUP*. When utilities like sam create a new */hp-ux* file, the old one is moved to */SYSBCKUP*. In this case, */SYSBCKUP* will always be the next most recent version of your kernel. You can manage this better yourself. For example, two bad kernel generations in a row could

by Dennis McClure

leave you with no good copy. It's a good idea to make your own copy with a name of your own choice. Also, if you know that */hp-ux* is the best possible kernel for your system, then */SYSBCKUP* would serve you better if it were an exact copy of */hp-ux*.

The kernel file can be removed or changed while you are up and running. You won't know there is a problem until the next attempt to boot.

When there is something wrong with */hp-ux*, you can boot a different kernel. See below, after the next topic, for instructions on how to do it.

Bad or Missing Programs, Scripts, or Configuration Files

The HP-UX boot procedure includes many complicated steps besides loading the kernel. The program */etc/init* runs. It reads */etc/inittab*, which indicates what run level to initiate and what things to launch for that run level. For a multiuser boot, many scripts run from the */etc* directory: *bcheckrc* checks file systems and then runs *fsck(1M)* if necessary; *brc* cleans up flags and the *mnttab* file; and *rc* initializes a long list of system processes and resources. File systems are mounted and network software starts. Then *getty*s are spawned and the console login is processed. Many of the files used during the boot process are idle between boots, making it possible for changes or deletions to happen while the system is up and running. The next time you try to boot, you might find the boot fails because of problems with these functions.

You can work around many of these problems by booting into single-user mode, and then fixing the things that are wrong.

Booting an Alternate Run Level or Kernel File from the Root Disk Drive

Series 700s:

1. Initiate a normal boot (usually by turning the power off and on).
2. You will see "Selecting a system to boot. To stop selection process, press and hold the ESCAPE key." Press ESCAPE briefly rather than holding down the key. Allow the search for potential boot devices to finish. This is a poll of every device on the SCSI bus.
3. Boot from the root disk to the ISL> prompt, using the ipl parameter:

   b p0 ipl (assuming that the root disk is listed as p0 in the search for potential boot devices)

   If you need help identifying which device contains bootable software, use the "search" option from the menu, then enter the correct device:

   p0 ipl

4. The system will boot to the ISL prompt. This is where you can specify what run level to boot into, and what file to use for the kernel:

   ISL> hpux [-i<run-level>] <kernel file>

   Examples:

   For booting */SYSBCKUP:*

```
ISL> hpux /SYSBCKUP
```

   For booting */hp-ux* into single-user mode:

```
ISL> hpux -is /hp-ux
```

   For booting */hp-ux.old* into run-level 3:

```
ISL> hpux -i3 /hp-ux.old
```

Series 800s:

1. Initiate a normal boot (use "<cntl>b rs" on newer systems to avoid having to turn the power off and on).
2. Interrupt the boot when you see "press any key within 10 seconds."

   "Boot from primary boot path (Y or N)?" Yes
   "Interact with IPL (Y or N)?" Yes

3. At the ISL> prompt, display the normal autoexecute command:

   ISL> lsautofl (or the abbreviation "lsa")

You will see something like one of the following, depending on your 800 model and the use of LVM:

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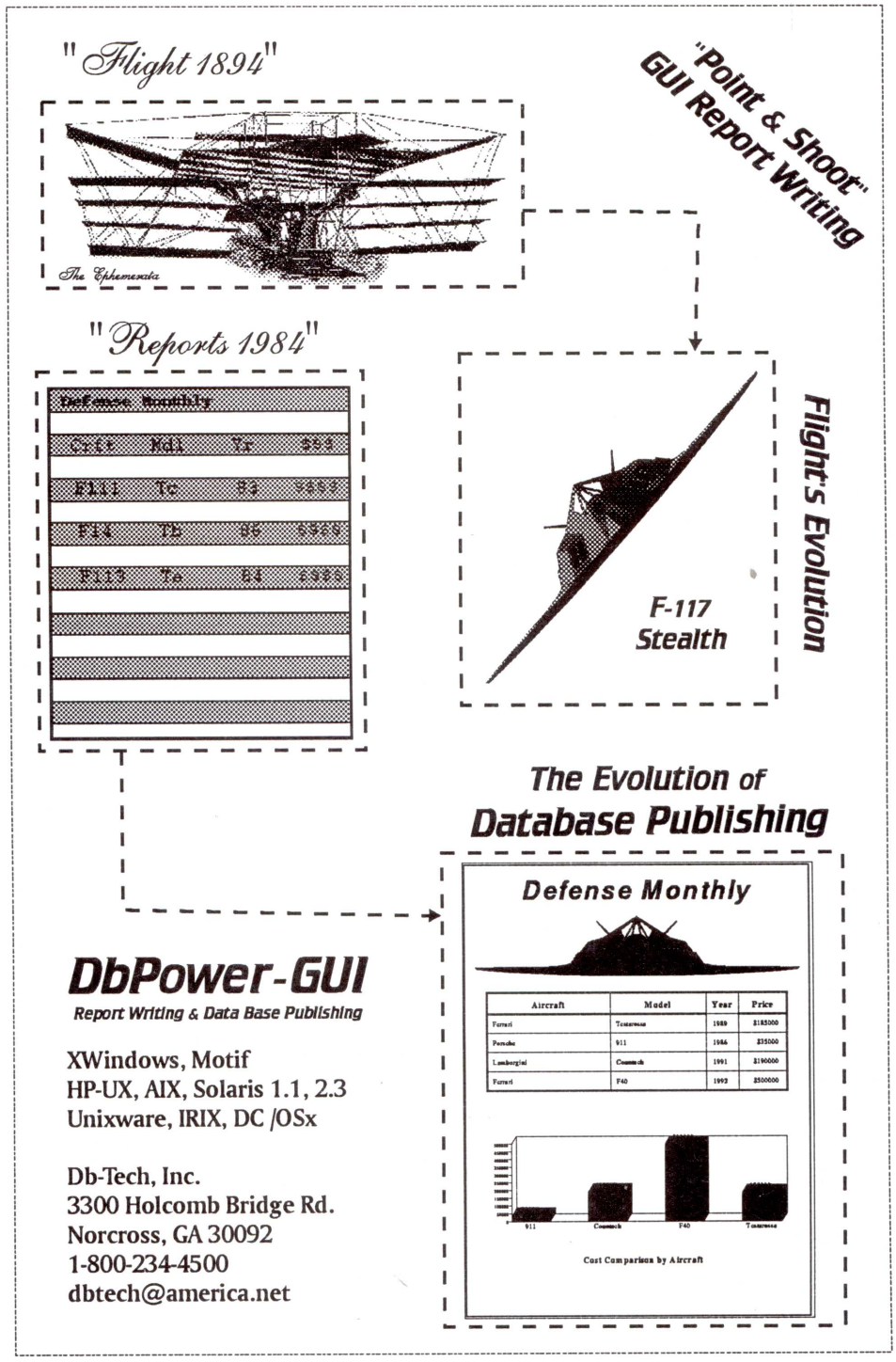


CIRCLE 35 ON READER SERVICE CARD

```
hpux (;0)/hp-ux
hpux disc1(4.0.2;13)/hp-ux
```

4. Enter the command essentially as you see it, changing or adding as needed. To change the kernel file name, change what appears after the "/". To indicate a run-level, insert "-i<run-level>" after the hpux command.

   Examples:

   For booting */SYSBCKUP:*

```
ISL> hpux (;0)/SYSBCKUP
```

   For booting */hp-ux* into single user mode:

```
hpux -is (;0)/hp-ux
```

   For booting */hp-ux.old* into run-level 3:

```
ISL> hpux -i3 (;0)/hp-ux.old
```

Listing Files from the ISL> Prompt

When there is doubt about the kernel file in the root directory, you can list the files that are present:

```
ISL> hpux ls /
```

Look for evidence that this is the root file system. You should see the typical directories, i.e., */bin*, */dev*, and */etc*, and you should see the files */hp-ux* and */SYSBCKUP*. You can look for other files that you suspect are missing, such as:

```
ISL> hpux ls /etc/init*
```

Problems in Logical Volume Manager

Series 800s can use Logical Volume Manager (LVM) as the method of disk organization and access. When LVM structures on the disk are incorrect, or when disks are not responding properly, the system can fail to boot. LVM error messages will indicate what type of problem is happening.

One requirement of LVM is that more than half of the physical volumes be present and responding. If not enough are available, the boot will fail this "quorum" test. There is a special boot option, *-lq*, that allows the system to ignore the LVM quorum. This boot option is used at the ISL prompt, like the *-is* option for single-user mode.

Boot from the primary path and interact with IPL:

```
ISL> hpux -lq (;0)/hp-ux
```

Once the system is up, you can pursue problems on individual disks.

Another possible problem involves the Boot Data Reserved Area (BDRA) and the LABEL file. Each time you change the configuration of the root volume group, both should be updated. You can update them with the following command, assuming default names:

```
# lvlnboot -R /dev/vg00
```

If there has been a change to the root volume group, and the BDRA or LABEL file has not been updated, the next boot may fail with "could not configure root VG." The special boot option *-lm* allows the system to boot in LVM maintenance mode.

Boot from the primary path and interact with IPL:

```
ISL> hpux -lm (;0)/hp-ux
```

When the system comes up, you will have to activate the root volume group, update the BDRA and LABEL file, and reboot:

```
# vgchange -a y /dev/vg00
# lvlnboot -R /dev/vg00
# reboot
```

An important LVM backup function that is often overlooked is the *vgcfgbackup(1M)* command. It backs up a volume group configuration from the physical volume to the file */etc/lvmconf/<vg-name>.conf*. If you lost one or more logical volumes, this file could be used as input for the command *vgcfgrestore(1M)*. It would recreate the LVM structures on the disk. Next you would recreate the file systems and restore files. Lacking this backup file, you would have to recreate the volume group from scratch, and the only way to do that for vg00 is to reinstall! The backup command should be done for each volume group after any change to the volume group:

```
# vgcfgbackup /dev/vg00
```

Fatal Error in Boot Area or File System

The HP Support Tape

When the root drive is unbootable, there are still many options left to try. The one we use most often when giving help from the Response Center is the HP support tape (or CD-ROM). This tape was originally developed by the HP Customer Engineer Organization as a hardware support tool. It was not intended to be used by customers, even during Response Center telephone help. On the other hand, we think it is the best tool available, so we use it.

The support tape is available for 700s and 800s. It is shipped with each order of software media, but many "Instant Ignition" systems (software already installed on the disks) are sold these days without software media. It is critical that software media also be purchased, so that it is possible to reinstall or recover from unexpected disasters.

The support tape is bootable. It contains a minimal kernel and a number of useful utilities. While booted from the support tape, "/" refers to the support tape's root directory, which is managed in main memory. Although there are many files available on the tape, only a few are loaded into this memory-based root file system, because of the limited space. You may load additional files as needed, subject to the space limitations. The *ls* command, for example, is not present unless you load it, because it is very large. We use *echo* * as a substitute. There are some automatic recovery options available, but I generally do not use them. I prefer to use manual techniques to change only those things that need to be fixed.

The general approach is to boot, then escape to a shell. From there, we attempt to mount the root disk under a mount point such as */mnt1*. Sometimes the disk file system has to be fixed with *fsck(1M)* before it can be mounted. It takes some expertise and experience to know what device file name to use in referring to the root disk. Remember, at this time the */dev* directory we are using is the one that came from the support tape, and the device file names may not match the names you are accustomed to using.

Once the root disk is mounted, we may need to change our point of view to the root disk using the *chroot(1M)* command (change root). Then it is possible to fix a number of faults that may be responsible for the failure to boot. We can fix a defective boot area, where the loader utility resides, with the *mkboot(1M)* command. We can gen a new kernel if needed using normal procedures. Sometimes we have to fix permissions, create device files, edit scripts or configurations, or restore files from a backup. If this can be done successfully, the final step is to reboot with default options from the root disk.

Before beginning any repair, it is good to verify that the damage does not extend further than is feasible to repair. It is terribly disappointing to hack through the repair of one file only to discover that all the other files are missing.

Support Tape Examples

The following is an example of the steps to boot the support tape on a 700 at 9.01 and repair the boot area of the root disk:

1. Boot from the tape device to the ISL> prompt, using the ipl parameter, then boot the support system:

   ```
   b p2 ipl (assuming that the tape drive is listed as p2
   in the search for potential boot devices)

   ISL> support
   ```

2. When the support tape menu is displayed, choose "load a file." When prompted for what files to load:

   ```
   ls chroot
   ```

3. When the files are loaded, return to the menu and select "exit to shell" to mount the root disk (/mnt1 is already provided as a mount point).

   ```
   # mount /dev/dsk/c201d6s0 /mnt1 (assuming the
   root disk is on single-ended SCSI, address 6)
   ```

   If fsck is needed, run it; then redo the mount command:

   ```
   # fsck -y /dev/rdsk/c201d6s0
   # mount /dev/dsk/c201d6s0 /mnt1
   ```

   Inspect to see if it looks like a root file system:

   ```
   # ls /mnt1/*
   ```

4. Switch to the disk file system and rebuild the boot area:

   ```
   # chroot /mnt1 /bin/sh
   # /etc/mkboot /dev/rdsk/c201d6s0
   ```

5. Switch back to the memory-based support menu:

```
# exit
# menu
```

6. Choose reboot from the menu, and let it boot as normal.

The following is an example of the steps to boot the support CD-ROM on an 800 at 9.0 and gen a new kernel:

1. Boot from the CD-ROM drive and interact with ipl, to the ISL> prompt.

```
ISL> supportcd
```

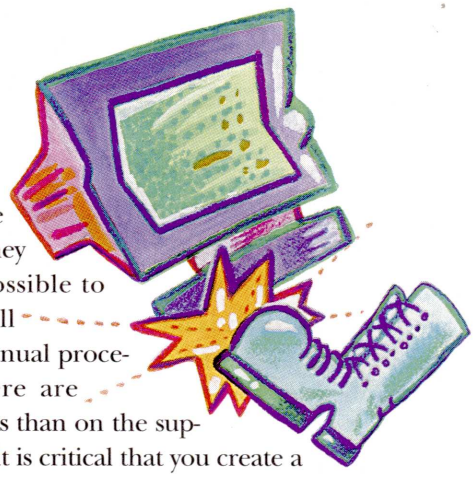
   When the boot is nearly completed, watch for it to display the device file name of rootdev. It scans disk devices from low SCSI addresses to high, assigning lu numbers starting with zero. If you have three SCSI disks, use lvm, and the root disk drive is at address 6, the device file name will be */dev/dsk/c2d0lvm*.
2. When the support tape menu is displayed, choose "exit to a shell", and make a mount point. (Command files will be available from the CD-ROM without loading them, because the CD-ROM is mounted automatically.)

```
# mkdir /mnt1
```

3. Fsck if necessary; mount the root disk and inspect as above.
4. Chroot as above. Use normal commands to gen a kernel and move it to */hp-ux*.
5. Run exit, menu, and reboot as above.

The Recovery Tape

The recovery tape is the other kind of bootable tape that can be used. It must be created by the user on Series 300s, 400s, and 700s, using the *mkrs* command. Depending on the kind of fault that prevents a normal boot, the recovery tape may be useful in fixing the fault, particularly on versions 9.0 and later. On the other hand, we find that the auto-recovery feature requires some manual steps that are not clearly documented. It copies a predefined set of files from the tape back to the disk, putting them in the */tmp* directory, in a subdirectory named *recovery.<mmdd>*. It is necessary for you to copy these files back to the regular places they belong. It is possible to escape to a shell and execute manual procedures, but there are fewer capabilities than on the support tape. Also, it is critical that you create a new recovery tape each time the system is modified in any way, including each time the kernel or critical configurations are changed. If you are depending on the recovery tape to save you from a disaster, it is highly recommended that you find a way to test it first in a non-critical environment.



Based on preliminary information, HP-UX 10.0 will have improvements in the recovery tape and support tape strategies. It will be worthwhile to check the details when they become available.

Diskless Clusters, a Special Bonus

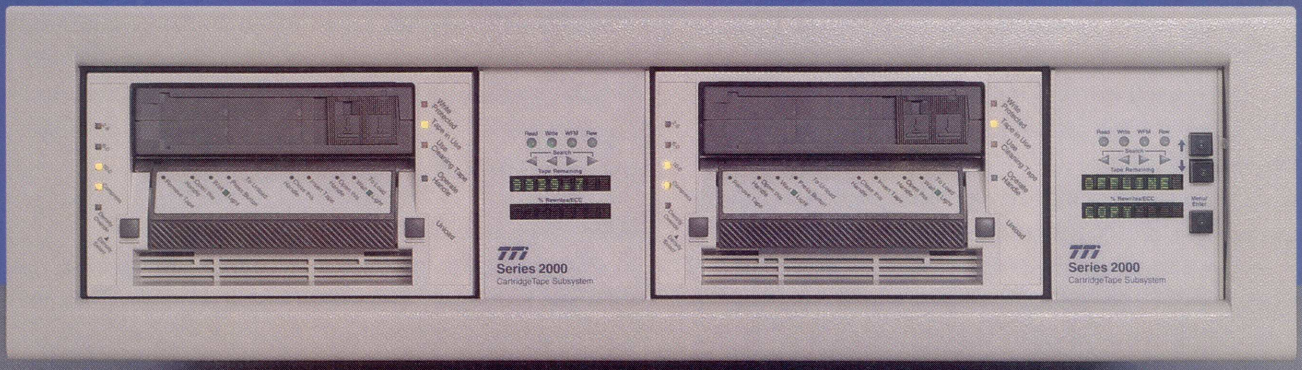
There may be one more alternate boot possibility that already exists and is ready for you to use—a diskless cluster server. In HP-UX 9.0, diskless cluster software is available for 300s, 400s and 700s. It enables client systems to boot over the network from the server's root file system. The original idea was to save the costs of disk drives for the clients. This advantage is disappearing these days as disk costs are shrinking. Another standard advantage is that system administration can be centralized on the server and this is probably the biggest reason for using diskless clusters today. A third advantage is often overlooked: cluster servers can provide redundancy for booting.

In many ways, booting a problem system from a cluster server is better than using the support tape. You have the advantage of running a full-sized kernel and a complete file system, with all UNIX capabilities available. Once booted from the server's disk, you would use the same repair procedures as in the support tape section above.

If a cluster client has trouble booting and the server is OK, then it is possible to log in on the server and manipulate the client's files. If it is the server that will not boot, redundancy depends on having a least one more server. You can configure each server as a client on a different server. If the problem system is a stand-alone system, and you have a diskless server available, you can temporarily configure the problem system as a client.

All members of the cluster must be on one "local LAN segment." Repeaters, hubs, and bridges between members are

DLT Exclusive!



Mirroring Mode
allows you to write the same data to both drives simultaneously.

Off-line Copy
lets you copy the contents of one tape to another without host involvement.

Cascade Mode
automatically writes data to the second tape when the first tape is full.

Independent Mode
lets you operate each drive independently.

Mirroring, cascading and off-line copy only in DLT drives from TTi.

Backup So Easy, You Can Do It With Your Eyes Closed.

When you need to make backups fast, look to the company that makes the fastest backup! TTi's new CTS-2119 dual drive DLT subsystem backs up 20 gigabytes native or 40 gigabytes compressed, with transfer rates up to 5 megabytes per second. But blazing speed and high capacity are just the beginning.

Independently or as a team, two DLT drives can tackle your workload better than one. Need a copy for off-site storage? With the CTS-2119, you can either make it when you do your backup or do it later off-line. This feature alone can cut your workload in half and dramatically improve system availability.

Need to backup more than 20 gigabytes unattended? Just select cascade mode and store up to 40 gigabytes without a tape change. But the features don't stop there. With a menu-driven front panel, you can select from an extensive list of options including host support, SCSI ID, compression and density selections. Your investment is protected by allowing you to choose from a long list of supported host computers, including DEC, Sun, IBM AS/400 and RS/6000, SGI, HP and more. Need to move to another platform? No upgrade required! Simply select the new host from the menu.

Host software doesn't support DLT? No problem. Our DLT can emulate a number of drives, including 8mm, DAT and others. Last, but not least, a multi-segment LED display keeps you updated with the current tape status, including tape remaining, operation in progress and tape condition.

Why settle for ordinary tape backup when you can have extraordinary? Call TTi for complete information on the CTS-2119.

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CIRCLE 27 ON READER SERVICE CARD

OK, but gateways and routers are not. This is because communication is based on link-level addresses rather than IP addresses.

It is very easy to change a cluster server's configuration to add a new client. It takes a bit more effort if the problem system has to be moved so that it can be attached to the server's local LAN segment. You might physically move the problem system next to an existing client, and then temporarily borrow that LAN connection.

It would take considerably more time if the cluster server was not already in place. You would have to install cluster server software using *update(1M)*, then configure both the server and the client. If you are not already familiar with clusters, you may not want to undertake this task in an emergency. However, it is a feasible technique, and sam does a good job with the configuration.

Based on preliminary information, there will be significant changes in HP-UX 10.0. Instead of HP's proprietary diskless cluster software, diskless capability will be provided as part of nfs. Support will be added for Series 800s as servers, but not as clients. IP addressing will be used, so a cluster will not be confined to a local LAN segment. One hop over a gateway or a router will be permissible.

Spare Root Disk Drive

The larger your organization, the easier it may be to plan your boot alternatives. If you have many systems, it may be cost-effective to prepare a spare root disk drive. It should be an external disk with the operating system fully installed. It would be handy if you could set the disk's address to one not used on any of the systems. It could sit on the shelf like an insurance policy, ready to attach to whichever system might need it. Boot from it, and fix damaged files as above.

A good choice for an external drive is a magneto-optical read/write disk. Since the media is removable, you could have several versions of the operating system, each on its own platter. You could also use the drive for many other purposes.

At the Response Center, we often need to test situations on any one of many currently supported HP-UX versions, so we install different versions to different disks on the same system. The leftover space on each disk is available for user data. We boot whichever version is needed, and mount all the other disks as secondaries. It was not our original purpose, but we also get boot redundancy this way. You can plan this for yourself by installing the smallest possible system to a secondary disk, to be used in case of disaster on the root disk.

In your plan, the "spare" root disk drive might be a root drive you can borrow from a different system. It would be easiest if the drive were in an external cabinet, but this is not necessary if you have the hardware expertise to rearrange internal disk drives. Alternatively, you could take the bad drive to a different system, where it could be attached as a secondary drive.

Before physically rearranging disks, there are some important cautions about the rules of SCSI buses. No changes should be made while the system is powered up. Shut down and power off the system first, then power off all peripherals on the SCSI bus, and only then make any cabling changes. Reverse the sequence to power up. If these rules are not followed, it is possible to corrupt data on the disks. Also, be sure to avoid any duplicate SCSI addresses, which are another possible cause of data corruption.

Reinstalling Software

Doing a reinstallation might be part of your plan, rather than the last resort. You could install a minimal system to a disk other than the root disk, boot the minimal system, and attempt to save the root disk. You might use any available disk for this purpose, even one that has necessary data, if you first back it up before using it for the install.

You could organize your disk environment so that reinstalling on the root drive is quick and harmless. Considerations might include:

- keeping only HP-supplied installed directories on the root drive, and all user data on secondary drives
- being prepared to recreate or restore every file that was customized or configured for your operation
- being prepared to restore or reinstall all patches applicable to software in the reinstalled directories

In the case of customized files, you could store copies in a special directory on another disk, or back them up separately, for easy restoring. The difficulty is being sure that you have identified all the pertinent files that various products modify. It would be good to test this procedure to be sure all customized files are identified. In the case of patches, some program files and shared libraries may not be replaceable by restoring, because they are in use. You can replace them if booted from another source, but that defeats the purpose of this approach. Reinstalling the patches may be easier.

Unsupported Boot Devices

HP will support systems that were installed from HP media using the standard install procedures. You may use other handy procedures, like the ones following, if you do not require HP's support for it.

Creating a bootable backup (Series 700s). A bootable backup tape, as used on an HP 3000, would be a very handy thing. Unfortunately, the only technique I have ever heard about is considered an unsupported one. On the other hand, it is listed in the man pages under *hpux_700(1M)*, restore option. Also, it was supported to the degree that patch PHCO_3927 was issued to make it work in 9.03.

To copy a boot area to a tape, and then copy the root file system (assuming standard tape and disk configuration):

```
# dd if=/usr/lib/uxbootlf.700 of=/dev/rmt/0mn bs=2k
# sync
# sync
# dd if=/dev/rdsk/c201d6s0 of=/dev/rmt/0m bs=64k
```

To boot from the tape and restore the entire root disk after a disaster:

> Boot from the tape device to the ISL> prompt, using the ipl parameter, then boot the tape system:
>
> b p2 ipl (assuming that the tape drive is listed as p2 in the search for potential boot devices)
>
> ISL> hpux restore disk(SCSI.6;0)

A number of cautions are required. The disk you copy to should be the same model disk that you copied from. A fresh backup has to be made any time there are changes affecting this disk. The *dd* command does not handle I/O errors, so if I/O errors occur, the results will be unpredictable and incomplete. The restore is not capable of spanning two different I/O controllers, such as a differential SCSI disk and a single-ended SCSI tape.

Creating a bootable disk. The following is an unsupported technique for creating a bootable disk. It could be useful on hardware such as a magneto-optical disk drive. This procedure was written for 700s by an engineer of the Belgium Response Center, with minor changes by me. It could be adapted for Series 800s.

Initialize the disk:

```
# mediainit -v /dev/rdsk/mo
```

Create a file system with 32 MB of swap:

```
# newfs /dev/rdsk/mo hpS6300.650A_32MB
```

Make the MO disk bootable:

```
# /etc/mkboot -v -u /dev/rdsk/mo
```

Mount the disk and copy the root file system:

```
# mount /dev/dsk/mo /mo
# find / -depth -hidden -xdev |
> cpio -pvdxulm /mo &
```

Modify */mo/etc/checklist* so it properly describes the disk drives that will be present when the mo is booted.

Conclusion

The lengths to which you are willing to go to repair a damaged root drive will depend on the value of the data you can save. Regular backups are the usual indicator of valuable data, but that value should also influence the investment you make in disaster planning. ◧

Dennis McClure is an HP Response Center engineer in Atlanta, Georgia, where he has provided help on downed systems since 1984. He was a founding member of the HP 3000 System Interrupt Team, and is now working on HP 9000s.

Encina/9000

by Paul Wang

Encina/9000 provides an open distributed on-line transaction processing (OLTP) environment that ensures data/transaction integrity across multivendor platforms, operating systems, and databases. Its flexible, modular, client-server design simplifies the construction of reliable distributed applications. This interoperability is achieved by adherence to standards such as Open Software Foundation's (OSF) Distributed Computing Environment (DCE) and X/OPEN's Distributed Transaction Processing XA interface. It is based on technology licensed from Transarc Corporation that has been tuned and enhanced for HP 9000 Business Servers and workstations.

Encina/9000 consists of Client, Server, Structured File System (SFS), Recoverable Queuing Service (RQS), Peer-to-Peer Communication (PPC) Executive & Gateway, and Monitor. In terms of the transaction processing monitor, users have a choice between the Encina/9000 monitor and the CICS/9000 monitor, which are both implemented on top of the Encina/9000 server component.

Encina is the first and most complete transaction processing system built on top of OSF's DCE and X/OPEN's XA. This is of critical importance for building open distributed client-server OLTP applications.

DCE provides a common platform (a consistent set of services) for developing and deploying distributed applications. Those services include remote procedure call (RPC), directory naming, time, security, threads, and a distributed file system. RPC is the natural choice for the client-server paradigm. It simplifies the development of distributed applications by providing a formal specification of the interface between clients and servers. Programmers on either the client or server side are free to code to that specification without concern for managing network connections, message packing and unpacking, and the complexity of the network. In addition, RPC integrates directory and security services so that servers can be dynamically located, clients and servers can be authenticated and authorized, and messages can be encrypted. DCE is available on many platforms including HP-UX, HP MPE/iX, IBM AIX, IBM MVS, DEC VMS, SUN Solaris, Microsoft Windows, and Microsoft NT. As a result, OSF's DCE is the best approach for achieving open enterprisewide client-server computing, particularly for large-scale heterogeneous configurations.

The X/OPEN Distributed Transaction Processing standard allows distributed OLTP applications and databases to be interoperable and maintain data integrity (see *Figure 1*). The application invokes the transaction manager to issue transactions. The application invokes the resource manager (i.e., databases) directly with data access operations. Finally, the transaction manager communicates with resource managers to define thread context and

to flow the two-phase commit protocol to preserve data integrity. XA is the interface between transaction manager and resource manager. XA has wide industry endorsement. Popular relational databases such as Oracle, Informix, Sybase and ALLBASE all support XA. As a result, building distributed OLTP applications with XA allows users to mix and match any XA-compliant database without being locked in to any specific database. In addition, it allows transaction data integrity across heterogeneous databases.

Encina/9000 also provides mainframe interoperability with support for the IBM LU 6.2 protocol with full Sync Level 2 over SNA and TCP/IP. LU 6.2 is the mainframe OLTP de facto standard. This service allows Encina applications to access and update data transactionally on mainframes. Similarly, mainframe applications can be off loaded to Encina systems.

Encina/9000 is part of HP's strategic distributed OLTP direction (see *Figure 2*). DCE/9000 and Encina/9000 provide an excellent foundation for distributed OLTP applications. To ease the development, execution, and administration of distributed OLTP applications, users may want to utilize a transaction monitor. HP offers a choice between the Encina/9000 monitor and the CICS/9000 monitor, which are both implemented on top of the Encina/9000 server component. For users offloading existing CICS applications or leveraging existing CICS investment and expertise, the CICS/9000 monitor is a good choice. On the other hand, for users developing new applications, the Encina/9000 monitor is the way to go.

Encina/9000 consists of the client component, a server component, and extended services (see *Figure 3*). The architecture is highly modular and flexible. Users can mix and match the configuration best suited to their OLTP environment.

The Client Component

The Client component provides facilities to define distributed OLTP applications, including transaction demarcation, transactional remote procedure call (TRPC), distributed two-phase commit, and multi-threading support (see *Figure 3*). It consists of four elements: Transactional C, Transactional RPC, Distributed Transaction Service, and Base Development Environment.

Transactional C

Transactional C is a set of macros and library routines for ANSI C. It allows users to define transaction demarcation and to integrate exception handling. For example, a transaction can be defined by the keywords "transaction" and "onAbort." The transaction clause defines a single unit of distributed work that is atomic, consistent, isolated, and durable (transaction ACID property). The onAbort clause defines exception handling, which traps any errors resulting in transaction abort.

Transactional RPC

Although DCE RPC provides network transparency with name and security integration, it alone is not suitable for transaction processing. If an RPC fails, the client has no idea if the server ever finishes the request or if the return message is lost. In fact, the request might be send to the server more than once because of retries.

Transactional RPC is based on top of RPC. It guarantees the "exactly once" semantics for request. In addition, if a transactional RPC fails, the encompassing transaction is aborted and all participants of the transaction will roll back any local or remote modifications.

Distributed Transaction Service

The distributed transaction service provides the two-phase commit protocol. The transaction state information is passed transparently via the transactional RPC mechanism.

The two-phase commit protocol guarantees all participants of a distributed transaction either to all commit or all abort their work. One participant is the coordinator. During the first phase, the coordinator polls all the participants to prepare the commit. If all participants agree, the commit decision is yes; otherwise, it is no. During the second phase, the coordinator informs all participants about the decision and commits or aborts the transaction accordingly.

Once a participant prepares to commit, it must disallow access to the relevant

FIGURE 1 *X/OPEN Distributed Transaction Processing Architecture*

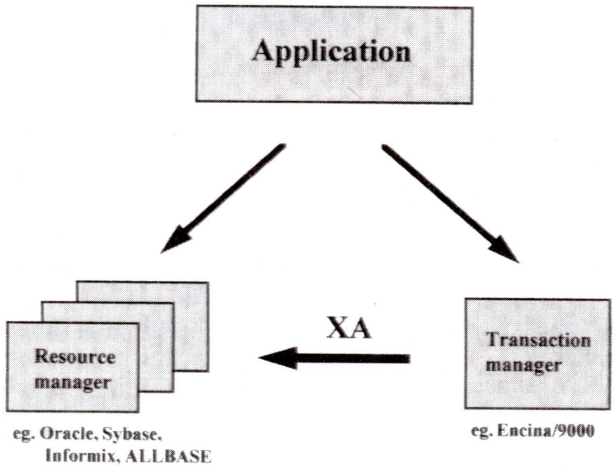
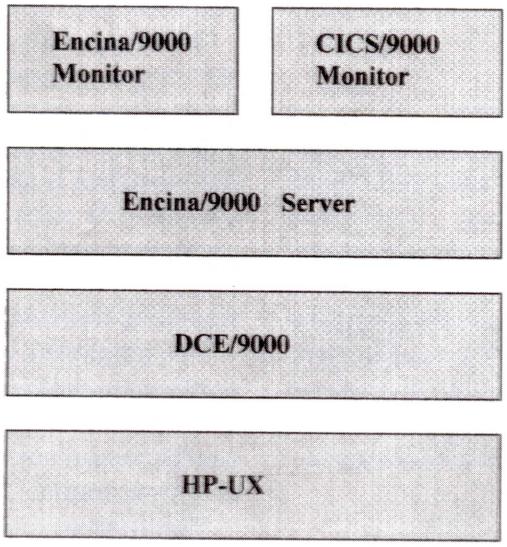


FIGURE 2 *HP Distributed OLTP Direction*



data (i.e., locking) so that it can commit or abort the work pending the outcome of the coordinator. If the coordinator (or the communication link to it) goes down, the data will be locked out until the coordinator is available. This is the vulnerable window for the two-phase commit protocol. Please note that data is still consistent; however, it might not be available until the coordinator comes back. In addition, if the coordinator goes down before a participant is prepared, the participant may abort its work without waiting. This optimization is known as "presumed abort."

To minimize the window of vulnerability, the distributed transaction service supports coordinator migration and heuristic outcome. Coordinator migration transfers the role of coordinator from a client to a more reliable server automatically. As a result, coordinators are less likely to go down (for example, rebooting a PC or workstation). In addition, clients without logging facilities (such as a diskless PC or workstation) may begin and commit transactions. Heuristic outcome allows users to force the outcome of the blocked transaction in order to make the data available.

Finally, the distributed transaction service also supports nested transaction. A nested transaction is a transaction within a transaction. The outcome of the nested transaction does not affect the outcome of the parent transaction. On the other hand, the outcome of the nested transaction is relative to the parent transaction. If the parent transaction aborts, the work of the nested transaction is rolled back even if it commits. This is useful for multi-threaded applications and failure isolation. For example, a nested transaction may be employed to allow participants to isolate locally and recover from failures without affecting the global transaction outcome.

Base Development Environment

The base development environment is the lowest layer of Encina. It isolates all the operating system dependencies from the rest of the product. This allows Encina to be easily portable to various platforms. Only the base development environment needs to be modified.

The Server Component

The server component provides facilities to manage recoverable data with transactional integrity. This allows users to build their own databases or resource managers. Alternatively, users might find it more convenient to use existing extended services, which are build on top of the server component, such as the Encina monitor, the CICS monitor, RQS,

and SFS. The server component includes the client component. It also consists of five additional facilities: Lock service, Recovery service, Volume service, Log service, and XA service (see *Figure 3*).

Lock Service

The lock service provides read, write, and hierarchical intention locks. Locks are transactional so that they are held until the transaction commits or aborts.

Log Service

The log service provides a distributed common log facility to store transaction outcomes and update images of recoverable data. Many applications may share the same log physically, and logically they see only their own log records. In addition, flexible archiving allows separate crash recovery (e.g., system failures) and media recovery (e.g., disk crashes).

Recovery Service

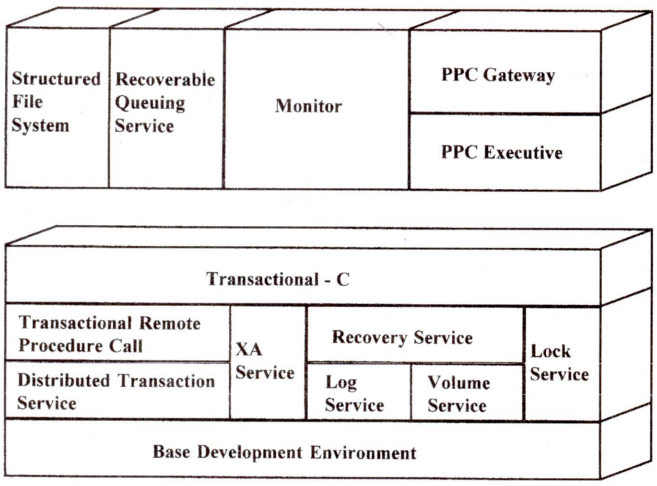
The recovery service provides recoverable data undo/redo logic. It is achieved by logging before images and after images of data updates to the log via the log service. By replaying the log, recoverable data may be rolled forward or rolled back according to the outcome of the transaction after a system failure.

In order to guarantee recoverability, the log is flushed in such a way that no dirty data can go to disk before its associated log record goes to disk. This is called write-ahead logging. In addition, log records are flushed right before transaction commit with the commit record to ensure the commit is durable.

Volume Service

The volume service is similar to the Logical Volume Manager (LVM). It allows files and file systems to span

FIGURE 3 *Encina/9000 Architecture*



multiple disks. It also supports mirror disks.

XA Service

The XA service provides transactional access to X/OPEN XA-compliant resource managers.

Extended Services

The extended services are OLTP products built on top of the server component. They include a monitor, structured file system, recoverable queuing service, and peer-to-peer communication service (see *Figure 3*). Users might find it more convenient to use existing extended services, rather than trying to build their own systems from the ground up. Users can also mix and match the configuration best suited to their OLTP environment.

Monitor

The monitor offers a complete environment and solution for open distributed OLTP to develop, execute, and administer Encina-based applications. It also hides and handles many details of DCE to ease DCE programming and administration.

In addition to the services provided by the client and server components that are available to users, the monitor further includes support for connecting front-end tools, binding clients to servers, and building integrated systems (for example, shared memory support for servers, diagnostic reporting, and audit trail construction). The monitor supports various front-end tools and 4GLs. In particular, OSF's MOTIF and JYACC's JAM are supported. JAM is a widely available WYSIWYG form editor that supports OLTP application construction without any "programming" by attaching an exit action (an interpretive TRPC) to a particular field or form.

The monitor execution environment provides support to ensure availability, performance, and security. It extends the transparent binding feature of DCE RPC to automatically perform load balancing across replicated instances of a server and to reroute work when a server fails. If a server or a node goes down, it can be restarted automatically. The monitor enhances security by protecting each server with centrally administered access control lists to prevent invocation by unauthorized clients. In addition, it provides application isolation so that only one client is active within a server at a time, reducing the possibility of interference.

The monitor provides centralized administration so that an authenticated administrator has access to a coherent view of the entire distributed OLTP system from anywhere in the environment. The administration includes configuration management, system monitoring, security administration, and performance management. In particular, users can monitor active clients, server availability and load, client authorizations, exception conditions, auditing information, performance information, etc. Moreover, configuration management provides startup, graceful shut down, and migration of servers in a distributed environment. Many services can be automated and replicated as well.

Structured File System

The structured file system (SFS) provides a record-oriented file system with transactional integrity and support of ISAM and VSAM API. SFS supports entry sequenced, relative, and B-tree clustering file organizations. It also supports multiple secondary indices and a range of locking strategies. In addition, National Language Support is included so that multi-byte characters and collation sequence can be handled.

Recoverable Queuing Service

The recoverable queuing service (RQS) provides a transactional priority queue that is durable for system failures and media failures. Since enqueue and

dequeue operations are part of transactions (two-phase commit), queued messages are always consistent and reliable. This is a very powerful service to increase application flexibility, performance, and availability.

Rather than waiting for all the associated tasks to be completed in a two-phase commit (some tasks might be over a wide area network), RQS can also boost performance (reducing response time) by transactionally enqueuing some tasks for later processing. In addition, those tasks can be processed in batch during off hours.

It can also increase application availability and resiliency against failures. Rather than aborting a transaction or denying a request if some servers are not up, RQS can enqueue task requests for later processing.

With multiple priority levels, RQS can be used to schedule a set of servers so that urgent tasks are always handled first.

Peer-to-Peer Communication Services

The peer-to-peer communication (PPC) service supports the IBM LU 6.2 protocol with full Sync Level 2 over SNA and TCP/IP. LU 6.2 is the mainframe OLTP de facto standard. This service allows Encina applications to access and update data transactionally on mainframes. Similarly, mainframe applications can be offloaded to Encina systems. This service provides interoperability with proprietary mainframe systems.

The PPC service consists of PPC executive and PPC gateway. PPC executive implements LU 6.2 over TCP/IP. In addition, it supports API for LU 6.2, CPIC (Common Programming Interface—Communications), and CPIRR (Common Programming Interface—Resource Recovery). PPC gateway provides transactional interoperability over an SNA implementation of LU 6.2. In fact, with Sync Level 2, LU 6.2 OLTP systems (such as CICS) can coordinate or be coordinated by Encina systems.

Conclusion

Encina/9000 provides an open distributed on-line transaction processing (OLTP) environment that ensures data/transaction integrity across multivendor platforms, operating systems, and databases. Its flexible, modular, client-server design simplifies the construction of reliable distributed applications. It also provides interoperability and two-phase commit data integrity among IBM mainframe OLTP systems and XA-compliant databases, such as Oracle, Informix, Allbase, and Sybase.

In the transaction processing marketplace, Encina/9000 is unique in its support of standards (for example, DCE and XA), modern programming paradigms (for example, multi-threading and RPC), and advanced technologies (for example, nested transactions and LU 6.2 interoperability with full syncpoint). As a result, it is an excellent choice for open distributed OLTP. ◧

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Systems Administration

by Chris Curtin

syslogd

IF YOU'RE LIKE ME, you use *cron* and *at* to execute custom scripts at all times of the day to assist you with your administration tasks. If you do, then you also know about getting e-mail after each script finishes to inform you of the current system status. I know that I get about 10 messages each morning from scripts that were completed overnight and almost always they inform me that everything went great, but you still have to read them!

Well, in this column I'll describe *syslogd* and point to some ways of using it to automate recording the statuses of your scripts and your system in general. What is *syslogd*?

syslogd is a daemon that is a standard part of HP-UX and of almost all other versions of UNIX that have any BSD heritage. In general it is a message-routing daemon. Used mainly for subsystems within HP-UX, it provides a very simple API (Application Programming Interface) that allows you to use it with your own applications. A configuration file defines the messages being monitored and the programs or groups of programs that generate them.

syslogd is configured by using an ASCII configuration file. The default location is */etc/syslog.conf*. The configuration file is made up of selector-action pairs. The selector defines what is being monitored and the action defines what happens when one of the monitored events occurs.

A selector is divided into two parts: the facility and the level. The facility is the application or group of applications that is generating the message and the level is an indicator of how severe the message is. Using this convention, it is possible to route specific messages to a log file instead of having to look at every message to catch something.

The facilities are defined as follows:

LOG_KERN:	Messages generated by the kernel
LOG_USER:	Messages generated by user processes (User processes are defined as any process not listed as a default facility or not using one of the available LOG_LOCAL facilities.)
LOG_MAIL:	Messages from the mail system
LOG_DAEMON:	Messages from standard HP-UX daemons such as *inetd* and *ftpd*
LOG_AUTH:	Messages from the authorization system such as *login, su, getty* and *uugetty*
LOG_LPR:	Messages from the print spooler system
LOG_LOCAL0:	
LOG_LOCAL1:	
LOG_LOCAL2:	
LOG_LOCAL3:	
LOG_LOCAL4:	
LOG_LOCAL5:	
LOG_LOCAL6:	
LOG_LOCAL7:	Local programs, including customer-written applications and scripts

The levels are defined as follows:

LOG_EMERG:	A panic condition
LOG_ALERT:	An important condition that needs to be addressed immediately
LOG_CRIT:	A critical condition that needs to be addressed immediately, but not nearly as bad as the LOG_ALERT case
LOG_ERR:	General errors, usually not affecting system integrity
LOG_WARNING:	Informational warnings, usually to draw attention to a problem or inconsistency before it gets out of control or fails
LOG_NOTICE:	Informational warnings, more of the type "Hey, you might want to look at this if you get a chance."
LOG_INFO:	Informational messages, usually to let you know what the system is doing
LOG_DEBUG:	Messages that are useful only during debugging of an application

The syntax of the configuration file allows you to remove the LOG_ from both the facilities and the level and change the case on the remaining part to lowercase for better readability. For example LOG_EMERG can be used simply as *emerg*.

The syntax of a selector is:

```
facility[,facility].level
```

The *[,facility]* syntax indicates that you can define one or more facilities with the same level by separating them by commas and adding the level only to the last one. For example:

```
local0, local1.err
```

defines a selector that is satisfied by both local0 and local1 errors.

Likewise one selector can consist of several other selectors. For example:

```
lpr.err;local0,local1.warning;kern.alert
```

is one selector that is satisfied by errors from the line printer system, warnings from the local0 and local1 systems, or alerts from the kernel. The semicolon is used as the separator for selectors.

The syntax also allows the use of the asterisk '*' to define all facilities with a single level. For example the **.warning* selector is satisfied by warning messages from any of the facilities. The final special case is the *none* level. The *none* level can be used explicitly not to log messages from a facility. For example

```
*.err;mail.none
```

logs all messages at level *err* or higher unless they come from the mail facility.

You'll notice in the last sentence I said "or higher" when describing what **.err* means. *syslogd* assumes that if you are interested in a message from a facility at one level, you will also be interested in any messages of a higher severity that occur. Thus **.err* means that you are interested in any message from any system with a level of LOG_ERR or higher. The order of severity is from LOG_DEBUG at the lowest to LOG_EMERG at the highest.

LOG_LOCAL Facilities

The LOG_LOCAL facilities are designed for use by the local system for whatever applications you choose. This means that you can have all your custom-written scripts and programs generate messages into one file instead of having a specific log file for each; instead of getting a dozen e-mail messages to check, you get one.

Before you choose a local facility for your use, check if any third-party applications are using that facility. The easiest way to do this is to call the third party and ask. If you cannot do this, turn on the facility with a level of debug for a couple of days and see if anything happens. If not, it is pretty safe to assume that no one else is using the facility.

Action Definitions

Now that we know what we can monitor with *syslogd*, what do we do with the messages when they occur? As I said earlier, each entry in the syslog.conf file has two parts: the selector and the action. The action can be one of the following:

- a fully qualified pathname to the file you wish to append the message to

- a hostname preceded by the @ character
- a comma-separated list of users who, if logged in, receive the message on their terminal windows
- an asterisk '*'

The *fully qualified pathname* to the file is the most common and may include device files such as */dev/console*. If the file does not exist, it is not created. If the file does exist, it is opened in append mode and the message is written to the file.

The *hostname* action causes the message to be sent to the remote host's *syslogd* and reprocessed. The selector is not changed on the message that is transmitted.

The *list of users* action sends the message to those users if they are currently logged in. If you are like me, you are almost never logged in as root, so adding your name to the list will speed up problem detection.

The last action, the *asterisk*, causes the message to be sent to all users who are currently logged in.

It is important to separate the selector and the action with at least one tab. If a tab is not used, *syslogd* will ignore the entry.

syslogd does not try to prevent duplicate messages from being sent to an action. Thus, if you have two entries that are using the same action, but are triggered with different selectors with the same facility, you will receive two messages. For example:

```
local1.debug    /usr/tmp/local1.log
local1.info     /usr/tmp/local1.log
```

will generate two messages to */usr/tmp/local1.log* for each message at info or higher level.

Starting *syslogd*

The *syslogd* daemon is started in the */etc/rc* file when HP-UX boots. The syntax for the *syslogd* command is:

```
/etc/syslogd [-f config file] [-m mark interval] [-d]
```

The -f option defines an alternative configuration file than */etc/syslog.conf*. The -d option turns on debugging of the daemon. The -m option defines an interval in minutes that *syslogd* will use to look for an entry in the configuration file that has *mark* as the facility. The default time is 20 minutes.

The mark facility will generate a time stamp message into the action associated with the selector. For example, an entry of

```
mark.debug /usr/adm/syslog
```

will generate a time stamp in the */usr/adm/syslog* file every twenty minutes (or the interval defined on the command line using the -m option).

After you change the configuration file, you can tell *syslogd* to re-read it by sending it a SIGHUP signal.

Using *syslogd* in Your Own Scripts

The *logger(1)* command allows you to send your own messages to the *syslogd* daemon from your scripts. The logger command has the following syntax:

```
/usr/bin/logger [-t tag] [-p priority] [-i] [-f file] [message]
```

The -t option defines the heading of the message being sent to *syslogd*. If not supplied, the user name of the executor is used. The -p option defines the selector to be satisfied by this message. The syntax is identical to that defined above, except that the asterisk cannot be used and only one facility/level pair can be supplied.

The -i option includes the process id of the executor with the message. The -f option tells logger to log the contents of the supplied file instead of a supplied message. The message option is the text to log. If the -f option and the message are not supplied, the logger command will look for the message on its standard input.

For example, if I wanted to log the completion time of my nightly backup to the system logfile and assuming that local1.info satisfies the correct selector, the following will generate a message in the correct log file:

```
echo "Backup Completed" | /usr/bin/logger -t [BACKUP] -p local1.info
```

One comment about using *syslogd*: Remember that logfiles grow without bounds unless you clean them up. I recommend modifying your */etc/rc* to make copies of existing logfiles and trimming them if necessary on startup, or modifying SAMs utilities to do this for your custom files. Also, remember that *syslogd*

will not create a file if it does not exist, so use *touch* to create the files after you have removed the old ones.

Now back to the original problem: All those e-mail messages. What I recommend doing is creating three entries in your */etc/syslog.conf* like the following:

```
local1.debug            /usr/adm/logfiles/local1.debug
local1.info             /usr/adm/logfiles/local1.log
local1.notice           /usr/adm/logfiles/local1.errors
```

Now modify all your scripts to use the logger command to generate LOG_INFO, LOG_WARNING and LOG_ERR levels for the local1 facility, depending on the completion status of your scripts. Next, have a *cron* task the e-mail the */usr/adm/logfiles/local1.log* to you and your other administrators each morning (or every hour depending on your configuration). After the file is mailed, have the *cron* task remove the file and use *touch* to create a new, empty file.

You will now receive one mail message with all your statuses. If you want to receive only bad news, have the *local1.errors* file mailed instead of the *local1.log* file. Also if you have multiple systems, you can use the hostname syntax on the action to funnel all the messages to one system. ◧

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Internet Goodies

by Joe Berry

THIS COLUMN IS MEANT to introduce you to one of the most valuable resources available on the Internet—computer programs.

Programs are available to help system administrators administer their systems. Network monitoring programs and nifty utility scripts are only a few of the admin tools to be found. For software developers, compilers, editors, and debuggers are only a sampling of the available programs. In addition, a wide variety of games, utilities, and applications can be found all over the world through the Internet.

Some of the programs are posted in various Usenet newsgroups while others are simply referred to via mail postings on the Net. If you don't know how to download programs with ftp, read my article "Anonymous FTP Access" in this issue.

The following paragraphs briefly describe some of the software recently posted. I don't attempt to cover all the programs I've seen, just those items I thought other people might like (actually, they're software I thought I might want!). The software is categorized under the newsgroups in which I found the items. "Miscellaneous" means everything else (e.g., *comp.unix.hpux, comp.unix.aix,* etc.).

ALT.SOURCES

Recently, a number of postings on the Net have had a commercial bent (that is, the postings were nothing less than advertisements). Many people accessing Usenet have been upset by this and have responded in ways they felt appropriate. Bill McFadden wrote and posted a program called adcomplain (Version 1.7), which composes and mails a complaint about inappropriate commercial use of Usenet.

As McFadden writes, "This was written in the belief that a single, concise message to the offending poster is the most appropriate way to complain. A message to his or her postmaster may also be warranted if the originating site prohibits such postings. Mail bombing (e-mailing megabytes of useless data) and public flaming (replying on Usenet, causing your complaint to be duplicated on every machine in the network) are discouraged."

Olaf Titz of Fachschaft math/inf, Uni Karlsruhe, FRG (*uknf@rzstud1.rz.uni-karlsruhe.de*) submitted a password generator program, pwgen, based on an old program from *comp.sources.misc* (volume 5, issue 59). He enhanced it to support modern systems. This program makes sure that passwords chosen are random strings and not a user's child's name, or whatever.

Zondo Pillock of the UK posted a game (in six parts) called "Wander." It is a game "where you wander around the screen collecting treasures, solving puzzles and avoiding the nasty monsters." It's a new version of an old game called "wanderer." Wander is a curses (screen-oriented, non-graphic) program that has been tested on DECstations running ULTRIX and SGI Indigos running IRIX. It might be fun to convert it to run under HP-UX. You can reach Mr. Pillock at *zondo@hunting2.demon.co.uk.*

COMP.SOURCES.MISC

arg_parse was submitted by Paul Heckbert of Carnegie Mellon University. According to him, "arg_parse is a subroutine for parsing command-line arguments. It is very easy to use, and yields a powerful, consistent command-line interface to programs. It supports argument conversion and type checking, arbitrary

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argument order, multi-character flag names, automatic usage messages, and expression evaluation. It is written in C. I've tested it on Sun, DEC, SGI (MIPS), and HP machines and it works perfectly. I haven't tested it much on other machine types." This program was posted as volume 44, issue 50 and is available wherever the *comp.sources.misc* newsgroup is archived.

Does anyone need barcodes printed on HP laser printers? Dennis Tayler of Mind Link in British Columbia, Canada posted hp-barcode to do just that. This program can be found in volume 44, issue 51.

COMP.SOURCES.X

A newly updated copy of xdvi was just posted to this newsgroup under volume 22, issue 110. Xdvi is a previewer for .dvi files, which are created by the mathematical word processing program TeX. Many of the Gnu project documents are maintained in TeX format. This software is also available via ftp from *ftp.x.org* in *contrib/applications* as xdvi.tar.Z.

COMP.MISC.UNIX

If you need JPEG image compression and decompression libraries, such a package was posted in volume 44, issue 98. It's big. The original post consisted of 27 parts! Quoting some of the comments in the front of the package: "JPEG is a standardized compression method for full-color and gray-scale images. JPEG is intended for 'real-world' scenes; cartoons and other non-realistic images are not its strong suit. The code includes a reusable JPEG compression/decompression library, plus sample applications 'cjpeg' and 'djpeg', which perform conversion between JPEG JFIF format and image files in PPM/PGM (PBMPLUS), GIF, BMP, Utah RLE, and Targa formats. Two small applications 'wrjpgcom' and 'rdjpgcom' insert and extract textual comments in JFIF files. The package is highly portable; it has been used successfully on many machines ranging from Apple IIs to Crays."

Are there any FORTRAN users out there running on HP-UX? Wade Schauer of Sierra Consulting Corp. contributed a curses screen-handling interface package for FORTRAN users. He writes that "F-curses (C) is a library of FORTRAN and C routines that gives FORTRAN programmers transparent access to the curses library (a C library). With it the FORTRAN programmer can create pop-up windows, menus, help screens, data entry screens, and much more (many features are demonstrated in the demos that come with the F-curses package). Although the features are character-based, an application written with F-curses works very well under X Windows when run in an xterm terminal." Please note that this program is shareware-based.

Schauer does have one caveat with his product. The library was written to work with versions of curses that are found in UNIX System V Release 3.2 or later. Unfortunately, HP's curses is approximately from the days of Release 2! This doesn't mean that the product won't work—you may have some problems getting it to compile or having the output look pretty. One solution would be to use the well-known curses library called ncurses instead of HP's. The F-curses library is found on volume 44, issue 125.

For software developers, Dennis Vadura, of the University of Waterloo, contributed 'dmake', yet one more super-duper make utility. It was posted in volume 45, issue 1, as 27 parts. It is also available directly from *plg.uwaterloo.ca* in the *pub/dmake* directory. "dmake is different from other versions of make in that it supports significant enhancements." It includes such features as enhanced macro facilities, portability between UNIX and DOS computers, and parallel making of targets on architectures that support it.

MISCELLANEOUS

For some people, the Berkeley printer subsystem is still the only printer subsystem worth having. Someone has recently ported the BSD 4.3 version of the lpr/lpd subsystem to Solaris 5.3. To get it to work on HP-UX systems will probably require some work, but because this software has gone all the way from BSD to SVR4, converting to HP-UX shouldn't be too hard. Any takers?

While it may soon be available locally, the software appears to have come from someone at the National University of Singapore. Ftp to *ftp.nus.sg*. From there go to subdirectory */pub/NUS/ISCS/misc* and get file lpr-sol2-p3.tar.gz. The size is 153,437 bytes and it must be un-gzipped. Thank you, Ann-Kian Yeo.

Most people in the UNIX world use either the "standard" compress program found on virtually all computers or the newer and more powerful gzip program from the Free Software Foundation. On occasion, I've seen somebody post some sources compressed with the PC-DOS program pkzip. Unzipping such a file ordinarily requires ftping the file to a PC, unzipping it, and returning the file back to the UNIX system. While I haven't tried it, you may want to get a copy of the UNIX unzip program that's available from *quest.jpl.nasa.gov* as unzip512.tar.Z in the */pub* directory. The code is very portable; you should have

no trouble compiling it anywhere.

Someone on *comp.unix.aix* posted a request for software that allows users to send alphanumeric messages to commercial pagers on systems such as Bell paging. Daniel Mathews, from Bradley University, responded by mentioning a program called snppage. It is available on *ftp.cox.smu.edu* in the */pub/paging* directory as files pagefilter.shar and snppage.shar.

For people trying to compile the GNU gcc version 2.6.0 compiler, a patch from HP is necessary for the compile to succeed. Get patch PHSS_4637.

For all of you emacs editor aficionados, the Free Software Foundation (FSF) has released emacs version 19.27. I have been using it for a while now and really like its functionality. Most of my windows work in color with proper enhancements to key words, etc., depending upon the mode I'm operating in.

And yet another FSF goody is the emacs man page support package called man.el. The new version can be found at *fly.cnuce.cnr.it:pub/man.el.gz*. A more local site than Italy (which is where this apparently came from) is *ftp.hmc.edu/pub/emacs/packages/man*. This man.el fixes some bugs and is more robust and quicker than the one supplied with emacs 19.26.

For those of you looking for an HP site that contains all sorts of "goodies" related to peripherals such as plotters and printers, here's one you should try. Do an ftp to *ftp-boi.external.hp.com*. Browse through all their files. You might find something of interest. An alternate site for HP printer software is *rtf.mit.edu* under the path *pub/usenet/comp.sys.hp.hpux/comp.sys.hp.hpux_FAQ*. Thanks to Rick Jones for posting this information on the Net.

And now for the site of the month. There's an ftp repository in the UK and mirrored at the University of Wisconsin that has lots of good HP software ready and willing to be copied. Binary software (i.e., precompiled software) may exist. The stuff I have downloaded was in source form with makefiles ready to be used on an HP machine. Simply do an ftp to *ftp.cae.wisc.edu* (if you're in the UK, go to *hpux.csc.liv.ac.uk*; if you're in Germany, try *hpux.ask.uni-karlsruhe.de*). Files are available that run on HP-UX 8.0 (there are people out there still on HP-UX 8.0!) and HP-UX 9.0. ◧

Joe Berry is a senior software developer at Landmark Systems Corporation in Vienna, Virginia. He is one of the authors of Landmark's performance monitor, TMON for UNIX. A former HP 3000 systems specialist for Hewlett-Packard, he has been in the computer industry for more than 20 years. He can be reached at joe@landmark.com.

XWatch

by Larry Headlund

Help!

ONLINE HELP AND DOCUMENTATION did not use to be a prominent part of UNIX. Originally, UNIX was by and for computer scientists and the source code and technical journal articles were it. As a matter of fact, all the documentation could fit in your briefcase. (It still can, but only if it is on CD-ROM.) Exhortations for Luke to go for the source are still a common response to requests for documentation, particularly with public software.

The first non-research use for UNIX was as a text processing system for Bell Lab. Hence nroff, troff, tbl, mm, and the whole alphabet of publishing tools. These tools had a lot of advantages. Besides being relatively user friendly (Have you ever used a keypunch machine? Correcting misspelling was an interesting procedure.), these tools had many other advantages. The documents themselves were plain text, without embedded hardware commands. There were some somewhat arcane printer control commands, but these were independent of any specific printer. Run through one filter, you got bold and underlined text on the screen. Through another filter you got a nicely formatted hard copy. And since these were printing commands in the text, not printer control codes, new printers could be supported by the addition of filters. You also had commands for including other documents within a document, making maintaining consistency much easier. When I was working on my Piled Higher and Deeper, I wrote 50-page papers using these tools and the line editor ed on a teletype terminal. But we were Real Men then.

As UNIX became more baroque, these publishing tools were used in the creation of manual pages. The man command could print or display whatever explanations the author thought were appropriate. These could range from the pithy ("This does what you would expect," for a game) to 50-plus-page mini-textbooks. If the writer was disciplined, the documentation followed standards. There was a short description, a format line, and a description of the options. There were some examples, an explanation of any bugs, and a list of related man pages. References to other commands and functions were underlined. The standard could be followed by actually reading the recommendations, or the writer could take the common path of copying an existing manual document and modifying it for the new command. The manual documents were even stored in defined places—a place for system administrator only commands, a place for system functions, a place for file formats, and so on. The new man pages were placed in the proper subdirectory of */usr/man* (or */usr/local/man* or */usr/contrib/man*) and they were on a par with the pre-existing documentation.

One of the powers of UNIX is the relative ease of adding functionality. And UNIX loves standards; that's why it has so many. So it is not surprising that a competing standard for documentation arose, texinfo. This one is particularly common in the Free Software Foundation/GNU universe.

Enter the GUIs

These documentation tools produce rather linear and text-oriented manuals. There are tools within these schools for describing graphics, but

they are not commonly used for documentation. For one reason, they don't port well to character terminals. The capabilities of graphical user interfaces awakened a hunger for help documentation that used those capabilities. Help documentation was an obvious candidate for hypertext. Hypertext documents, like *Last Year at Marienbad*, have a beginning, a middle, and an end, but not necessarily in that order. You navigate through a hypertext document, selecting more detail on a particular topic or exploring a related document. What a natural way to access documentation!

There have been some responses to this challenge. The commercial desktop publishing package FrameMaker has some features that aid creation of documentation, including a display-only license manager for help. You can use all the FrameMaker tools for graphics, indexing, and version control with your help creation. More recently, the Common Desktop Environment (CDE) of the COSE initiative includes a help system based on the Bento format for documents from Apple. This format allows you to have active objects inside a help document. That is, you can click on a screen or icon within the help document and launch a demo or anything else.

All the above solutions require, of course, that the documentation be rewritten in the new format. What a load of work is implied in that "of course"! Continuing work, too, as you integrate new packages into your system. I wouldn't consider it desirable to force users to learn several distinct help systems and force them to remember which command is accessed through

which system. I know I don't like to have to do it.

An Ideal Help System Specification

Stepping back, what features would an ideal help system have? My wish list includes:

A. Hypertext navigation. Click on a topic, open the document for that topic. I would want to be able to move between documents and have the system keep a map of where I have been for me. I should be able to jump forward and backward in this list.

B. Printing. I want to be able to get hard copy of the document I'm looking at. It does not help to save the rain forests, but that paper is still needed.

C. Reusability. I want the tools available for my own projects. This ideal help system must be suitable for use not just for system help but for internal help. The most direct way would be to have the help tools built around a widget. Then that widget would be on a par with the other widgets in my application. Since I write mostly in Motif, that implies a Motif widget. In general, for documentation tools that aspire to be a standard and to be used as widely as possible, this rules out a GNU General Public License (GPL). Such a license would force the whole program incorporating the embedded help through a widget, which implies a library link, to become itself distributable under the GPL, and would not have a lot of appeal for commercial software creators. Release under Library General Public License, which does not impose the same responsibilities on those who use the code, would seem more appropriate. It is the original author's choice, of course.

D. Backward compatibility. The existing documentation written to some standard should not have to be rewritten to fit into the hypertext system.

E. Cut and Paste. This is mostly for the examples. If there is an example of a typical command with arguments, I want to be able to cut it out, edit it as needed, and execute it in my term or command window.

F. Authoring support. There should be an easy, intuitive, and WYSIWYG way of creating and modifying the documents. This is given heightened importance by programmers' well-known reluctance to document. If professional help document writers are not available, there should be only minimal stumbling stones in the path to help documents for amateurs.

G. Notes. Users should be able to add personal notes to a document for their use only. This implies the authoring support in item F is in place.

Hman

At this point I should announce that I have found a package on the Net that has feature A through G and H through Z for good measure. Well, not quite, but hman by B. Raoult (*mab@ecmwf.co.uk*) handles A through D very well.

In the README included in the package the author says that the hman program is designed to highlight the features of the included HyperWidget. Since the HyperWidget is Motif-based and the whole package is public domain, we have item C (reusability) covered. If your application construction tool allows you to add widgets, there should be no problem. I added it to the Widget Control Language (WCL) smoothly. We have further confirmation of the ease of integration because the hman application itself was built using the commercial GUI constructor X-Designer. So the HyperWidget can become your tool of choice for displaying help.

The hypertext navigation of item A is fully implemented. When you click on a highlighted item, the corresponding document is opened. There is even a nice zoom animation effect. The last 100 selected items are kept in a history so you can retrace your steps if you wish. Hypertext navigation is handled inside the widget by a special binding to the select action when the selected text is highlighted. A side effect of this is that the usual mechanism for cutting and pasting a selected chunk of text does not work.

So item E, cut and paste of example text, is not available.

Printing is not available from within the application. Since these are the normal man pages, you can print the document using the usual man | lp construct. When constructing my own variation on the hman program, printing inside the application was

easy to add. So item B, Printing, is somewhat covered.

It is on item D, Compatibility, that hman really shines. All your existing man pages, and any new man pages, automatically become part of a hypertext system. This is accomplished by a clever parser inside the hypertext widget that interprets the underlined sections as pointers to other hypertext objects. If the author of the man pages has ignored standards and chosen to highlight sections of text that do not point to other man pages, then the application fails gracefully by not finding the indicated pages when the user double clicks on the highlighted text.

The authoring tools (item E) for hman are the same as those for vanilla man pages—that is, essentially none. The usual method of copying an existing man page and modifying it to fit the new application to be documented has to suffice. Any authoring tools developed for conventional man pages would work for hman. As a corollary to the lack of authoring tools, there is no way to attach customized notes to a document.

Getting and making hman

The hman package was originally released under X11R4 and was in the contrib section of X11R5 also. With the release of X11R6, it is no longer in the contrib section of the release. You may find it on older CD-ROM versions of X software. Failing that, it is archived with *comp.sources.x*. I got my current copy from

usc.edu:/archive/usenet/sources/comp.sources.x/volume16/hman

Check archie for a site near you.

Making hman is reasonably straightforward if you have imake and its supporting files correctly set up for your machine. The only change I had to make was adding the line

```
#include <Xm/PrimitiveP.h>
```

after the line

```
#include <Xm/XmP.h>
```

in the file HyperP.h. This probably reflects a change in Motif include files from Motif1.1 to Motif1.2.

Conclusion

While hman is not perfect, it is well worth the (minimal) effort to install it. I personally use it in preference to the HP-supplied Motif help program. ◧

Larry Headlund is president of Eikonal Systems and has been working with commercial UNIX since 1982 and with X since 1987. He can be reached at lmh@world.std.com or 617.482.3345.

Industry Watch

MUCH ADO ABOUT INTEL'S problematic Pentium this winter. While debate continues on the real risk of using the precarious processors, both Compaq Computer and Digital Equipment Corp. upheld their penchant for Pentium with major releases of products based on it.

Compaq claims its new Deskpro 590, based on a 90-MHz Pentium, maximizes Pentium performance with the company's TriFlex/PCI architecture. The TriFlex/PCI architecture, also featured in Compaq's ProSignia 500 Pentium-based servers, promises optimized data flow among a 64-bit processor bus, a 64-bit memory bus, and a 32-bit I/O bus. Right in step, Digital introduced its Prioris HX Pentium-based SMP application servers, featuring the Power Scale architecture. Also using a 90-MHz Pentium, Digital says its Power Scale, which features a motherboard/daughter-card design, offers users better flexibility and migration options than architectures of its competitors. The company also claims the Prioris HX to be the first PC server in the industry to integrate a PCI-PCI bridge to ensure high performance across local area networks.

Meanwhile the Pentium peal from Compaq and Digital was muffled by IBM's announcement in December that the company was halting shipment of its PCs based on the Pentium processor. Although Intel has assured manufacturers that the likelihood of problems from the flawed Pentium are extremely remote (approximately once in 27,000 years), IBM says its research indicated that common spreadsheet programs, recalculating for 15 minutes a day, could produce Pentium-related errors as often as once every 24 days.

Getting beyond all the Pentium prattle, IBM has been making much of its new deal with Red Brick Systems. In the agreement, IBM will provide Red Brick's Warehouse VPT RDBMS on its SP2 POWER parallel system. Designed for data warehouses of 500 GB or more, the SP2, IBM claims, offers high-performance parallel query processing for decision support. The Warehouse VPT software currently runs on a single processor, or single node, with plans to support a single database on multiple nodes in the second half of 1995.

The RDBMS story of 1994, though, was the demonstration at DECUS '94 in Anaheim of an 8-GB Oracle database running on Digital's 64-bit Alpha computers. According to Digital, the accomplishment is the world's largest in-memory commercial UNIX-based relational database, which would be impossible to implement with current 32-bit systems. The company claims initial tests show performance gains of 600 to 800 percent when compared to previous database technology, achieved at one tenth of the system cost of a traditional mainframe solution. Both companies see great promise for applications such as decision support, data warehousing, micro-marketing, geographic information systems (GIS), online transaction processing, and video-on-demand. ◧

Industry Watch is written by James. H. Gamble.

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CSL Perspective

IN THE LAST ISSUE'S column, I began to describe in some detail the steps for installing a CSL contribution. I hope most of you found it useful and informative despite the sometimes dry nature of discussions of this type.

If you were unable to browse through the previous discussion, call or drop me a note. I'll see that you get a copy.

Last time I was describing files that you will find included in most software. Files with names like README and INSTALL contain introductory information about a program. In many cases, a step-by-step description of the installation is included or a pointer to another file is noted. These files are always the first place you should consult before going any farther. Even for experienced software developers, it's a good idea to have a thorough understanding of the configuration before proceeding. I typically will print out these files, highlighting the pertinent information, and then keep this paper copy close by once I've begun configuration and compiling. You'll find that most developers will take the time to produce good documentation for their software, especially if they want to avoid a lot of e-mail from users with problems. Remember, it never hurts to overdocument.

For the remainder of our discussion, let's use another contribution from the 1994 release as a example. Once you've unbundled the *less* contribution (f0022), the directory will contain the files shown in *Table 1*.

As you can see, there are files with a variety of names. In general, the naming convention is pretty standard. Files with the ".c" are C source, ".h" are the header or include files, ".nro" is the source of the man page, and ".man" is the formatted man page (i.e., it was produced by running the ".nro" file through the *nroff(1)* text processor). Although you don't see an example here, the manual page sources also come with numbered file extensions corresponding to the manual section (vi.1, sam.1m, etc).

Since we've already consulted the README file (you did read it, right ?), we know that to install the program we first need to run a shell script called *linstall*. This script is actually a blessing in disguise. The author has automated the configuration process so that we don't have to do any editing of the files in order to get the program to compile. In other contributions, this script might

TABLE 1 **less *Files***

README	install_help	lesskey.c	option.c	signal.c
ch.c	install_key	lesskey.man	os.c	tags.c
cmd.h	install_kman	lesskey.nro	output.c	ttyin.c
command.c	install_less	line.c	parts	vecho.c
decode.c	install_lman	linenum.c	position.c	version.c
defines.h	less.h	linstall	position.h	
funcs.h	less.help	main.c	prim.c	
help.c	less.man	makefile	prompt.c	
input.c	less.nro	mkfuncs.awk	screen.c	

be called Configure. In general, if such a script is provided, you should use it. But be careful: the author has made some assumptions about the local configuration and compiling options. Always scan the various files to be sure everything is in order.

Let's look at the files that *linstall* created: *makefile* and *defines.h*. *Listing 1* shows the configurable part of the file *makefile*. I've deleted the initial comment block and the build dependencies and rules. We'll discuss the purpose of the makefile in a minute. As you can see, several variables or "macros" have been defined for us. These macros will be used during the compilation, linking, and installation phases. In this case, the macros have been defined with various file names, library search lists, and compiler optimization flags. Because of the way I've chosen to set up my local site configuration, I'll need to change the INSTALL_LESSMAN and INSTALL_KEYMAN macros to *$(ROOT)/usr/local/man/man1/less.1* and *$(ROOT)/usr/local/man/man1/lesskey.1*. I also want to change the location of *HELPFILE* to */usr/local/lib/less.help* since I don't want non-executable files in my bin directory. To make these changes, simply use your favorite text editor on the file.

You should also look at *defines.h* for any macros that might need modification. Remember that the *linstall* script intelligently set some of these macros based on what it discovered about your system. Unless you fully understand what

LISTING 1 *Partial* **less** *makefile*

```
##########################################################################################
# Compilation environment.
##########################################################################################

# LIBS is the list of libraries needed.
LIBS = -lcurses -ltermcap -lPW

# INSTALL_LESS is a list of the public versions of less.
# INSTALL_KEY is a list of the public versions of lesskey.
# INSTALL_HELP is a list of the public version of the help file.
# INSTALL_LESSMAN is a list of the public versions of the less manual page.
# INSTALL_KEYMAN is a list of the public versions of the lesskey manual page. INSTALL_LESS
=    $(ROOT)/usr/local/bin/less
INSTALL_KEY =      $(ROOT)/usr/local/bin/lesskey
INSTALL_HELP =     $(ROOT)/usr/local/bin/less.help
INSTALL_LESSMAN = $(ROOT)/usr/man/man1/less.1
INSTALL_KEYMAN =  $(ROOT)/usr/man/man1/lesskey.1
LESS_MANUAL =      less.nro
KEY_MANUAL =       lesskey.nro
HELPFILE =         /usr/local/bin/less.help

# OPTIM is passed to the compiler and the loader.
# It is normally "-O" but may be, for example, "-g".
OPTIM = -O

CFLAGS = $(OPTIM)
...
```

to change and why, you might want to go with it for now.

We're ready to compile and link the program and we'll use *make(1)* to accomplish this. In a nutshell, *make(1)* is a tool that generates commands for execution by the shell. These commands are most commonly those that would be used to manage a collection of files, such as a programming project. Common program development tasks such as compilation, linking, library construction, and directory maintenance are greatly simplified once the interrelationships between these files have been defined in the Makefile.

Since *make(1)* is such a useful tool, you should find a Makefile in almost every CSL contribution. If you want to learn more about *make*, consult Chapter 13 in *Programming on HP-UX* or get *Managing Projects with make* from O'Reilly & Associates.

One more thing before we build *less*. You'll need a C compiler on your system in order to proceed. Every HP-UX system comes with the K&R C compiler in order to build your system's kernel. This compiler, although relatively functional, is not recommended for the serious program developer. HP, as well as many other UNIX vendors, have unbundled their full-feature compilers from the base system software. This decision is good for the users who might be running off-the-shelf applications since they would not be paying for a compiler that will never be used. But a software developer must either buy the ANSI C compiler from HP or find another one. On the 1994 CSL release, you will find the latest version of the Free Software Foundation's GNU C Compiler. We have also provided the PA-RISC 1.1 binary as well.

Once that compiler or the HP ANSI-C compiler is installed, you can proceed with the make; you're ready to build the program. Type the command `make` and sit back and watch. You'll notice the process echoing the commands that are executed; *Figure 1* shows what I see. The lines with *cc -O -c* are running the C compiler and producing files with a file name extension of '.o' and the *cc -O -o* will cause the linker to produce the executable. The line with the *-DHELPFILE* is compiling the *help.c* module and sending a macro definition into the compiler preprocessor stage. This technique of providing macro values at compile time is relatively common. If an error were to occur in the process of compiling, the make would stop immediately. Since most of the CSL contributions have already been run though a compile test, errors are rare.

FIGURE 1 ***Partial make Log Messages***

```
$ make
          cc -c main.c
          cc -O -c option.c
          ...
          ...
          ...
          cc -O -c -DHELPFILE=\"/usr/local/bin/less.help\" help.c
          ...
          ...
          cc  -O -o less main.o option.o prim.o ch.o position.o input.o output.o
screen.o prompt.o line.o signal.o os.o help.o ttyin.o  decode.o command.o
linenum.o tags.o version.o -lcurses -ltermcap -lPW
          cc -O -c lesskey.c
          cc  -O -o lesskey lesskey.o
$
```

At this point, the program is compiled and can be run from the local directory. You should test the execution of the program, if possible, before moving it to its final installation directories. Sometimes, programs cannot be tested locally, so you need to run *make install* to move everything to its final location. You must install as the root user (either through *su(1)* or by logging in) as you will be installing files in protected system directories. The installation is again accomplished through the use of *make*. As before, you can watch this process and see what commands are being executed. If you are the type who gets really nervous installing software, use the -n (no-execute) option to view the commands first.

That's enough for now. Next month, I'll review the variations of this process for the X Window and Motif contributions. ◧

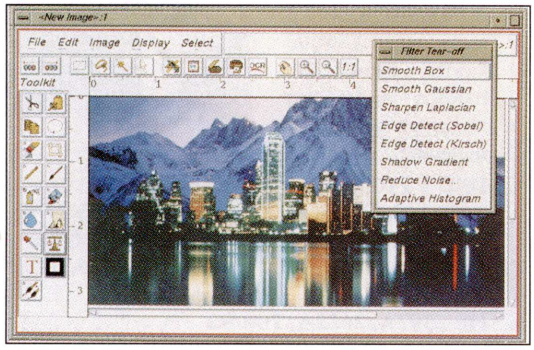
Paul Gerwitz is chairman of the CSL/HP-UX committee and is a technology specialist at Eastman Kodak Company in Rochester, New York. He can be reached by phone at 716-477-3067 or by e-mail at gerwitz@interex.org or gerwitz@kodak.com.

Product Focus

Pixel!FX Version 3.0

"The fact that PC and Mac applications are moving to UNIX validates the UNIX platform in general for working with images," said Mark Tavill, President of Mentalix. He is encouraged by the availability of Adobe, Aldus, and Corel PC applications on UNIX machines rather than concerned that these products compete with Pixel!***FX***, Mentalix' all-in-one image scanning, editing, and optical character recognition (OCR) package for UNIX.

Tavill isn't counting on his product's ability to exploit the UNIX operating system's superior performance and large file handling to differentiate it from other image manipulation products—all graphics packages on UNIX take advantage of these operating system strengths. Rather, Tavill believes Pixel!***FX***, particularly the recently released Version 3.0, will carve a nice niche for itself because it addresses UNIX's weaknesses: lack of standards and PC-quality GUI. That and the fact that "it's a real 'kitchen sink' product; it does what a lot of people want to do," he said, adding, "(We) provide a lot of capability at a reasonable price."



Pixel!FX Version 3.0

A Pixel!***FX*** floating license, which costs $1,599, integrates three stand-alone applications: Pixel!***SCAN***, which serves as a high-performance interface to a variety of scanners; Pixel!***VIEW***, which enables users to display and translate images in a variety of file formats; and Pixel!***EDIT***, a comprehensive image enhancement and photo retouching application. Pixel!***OCR*** is an optional package that enables scanned line art to be accurately converted to ASCII text and imported into publishing or word processing programs for text editing.

Version 3.0 includes a revamped "Windows-style" interface, integrated print management capability, and an API that enables image scanning, file conversion, and OCR to be performed from a UNIX shell or third-party application.

Mentalix' scanning software, Pixel!***SCAN***, enables support of multiple scanners, including those from AGFA, Fujitsu, HP, Howtek, Microtek, Sharp, and UMAX. PC users may not see this as a considerable accomplishment, but that's because the PC world has TWAIN, a generally accepted scanning standard. There is no TWAIN-like standard on UNIX, so much work was done to support each of the nine platform device drivers for nearly 20 scanners.

Tavill praises Pixel!***SCAN*** for its advanced features, claiming, "The SCAN module is as good as anything else out there, period." Pixel!***SCAN*** offers prescanning to display a low-resolution color representation of the image to be scanned. In prescan mode, users can adjust size and scanned area of an image, zooming in and out to view it. Color, size, resolution, and output parameters also can be interactively controlled. Scan images also can be saved directly into a TIFF file.

The scan module's integration with the Pixel!***EDIT*** module enables users to bring scans directly into the module for image altering. Pixel!***EDIT*** features unlimited undo/redo, and Tavill remarked, "(The market) is finally seeing other products that have this, but it's an exception." With Pixel!***FX***, 199

different edits can be undone.

Editing functions are enhanced by a "Windows-style" interface that makes the product easy to learn and use for those with PC or Mac experience. Icon toolbars that are available in every Pixel!***FX*** window and tear-off menus, which allow frequently used menus to remain open and be moved around the screen, improve ease of use. In addition, the new point-and-click interface has been designed such that "75 percent of the capabilities on our product are accessed with a single mouse click," Tavill remarked.

The interface also enables users to drag an image icon over a function icon to execute a function—much as dragging a file or disk over the Macintosh "trashcan" icon will delete a file or eject a disk. Users also can drag image icons to or from applications compliant with Motif 1.2.

Integration with other applications is achieved through the Pixel!***VIEW*** module, which supports 15 file formats. With Version 3.0, the product supports the WordPerfect image file format (.WPG) so that users can save images directly into WordPerfect UNIX documents. It also supports many file structures, but Interleaf and FrameMaker users can actually integrate Pixel!***FX*** into their environment. For example, Tavill explained, a user can call up Pixel!***FX*** from the FrameMaker menu bar, use it to edit an image, and save that image directly to the FrameMaker document. To edit a saved graphic with FrameMaker, a user has only to double-click on a picture and edit. Pixel!***FX*** and FrameMaker applications have to be on the same network, but not necessarily the same machine.

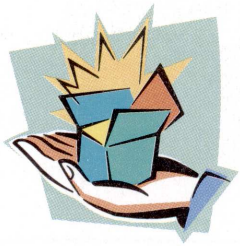
The linking of applications in this manner is similar to the capability provided with such PC standards as Object Linking and Embedding (OLE). However, as with TWAIN, "There is no such thing as OLE in UNIX," said Tavill. Rather, Pixel!***FX*** and similarly featured applications are recognized by FrameMaker as "live-linked inset editors" and by Interleaf as "layered applications."

Users can purchase an optional OCR engine, which reads the black and white areas of a scanned hard-copy document and converts that data into letters recognized as such. Tavill noted that Pixel!***OCR*** is a "very accurate engine, and that's its strength." In fact, company literature quotes 99 percent accuracy. Tavill recommends it for "casual, moderate" use, since the scanners that are fast enough for heavy duty use are not supported. He also noted that the Pixel!***OCR*** engine does not "necessarily have all the bells and whistles" offered in other products, but added that users converting 10 to 40 pages per week "would probably be very happy with our product."

While noting that Pixel!***FX*** "does a lot of things and does them well," Tavill acknowledged that it is not for everyone. Adobe Photoshop has image manipulation features "that we don't have, nor do we intend to offer them," he said. He advised people needing advanced features beyond those provided in Pixel!***FX*** to buy something like Photoshop, but "what they should buy with Photoshop is my scanning product."

Contact Mentalix Inc., 1700 Alma Drive, Suite 110, Plano, Texas, 75075, phone: (214) 423-9377, fax: (214) 423-1145, e-mail: info@mentalix.com. ◧

Michelle Pollace is the New Products editor for hp-ux/usr.



New Products

HP-UX 10.0 Release Dates Set

Hewlett-Packard has announced the long-awaited arrival of HP-UX 10.0. The *new* business release is slated for February 6, and the *general* business release is scheduled for mid-1995. The new business release is specifically aimed at ISVs and existing customers who have new projects requiring 10.0 functionality. When the general business release comes, HP will have key third-party applications and HP LAN products available.

HP-UX 10.0 is binary compatible with HP-UX Version 9.04.

Some of the key contributions of 10.0 are providing high-end scalability. For scaling applications across the enterprise, HP will be bundling the DCE client services, remote procedure call timing, and threads with HP-UX 10.0.

Release 10.0 enables symmetric multiprocessing (SMP) for future multiprocessing HP 9000 workstations. Enhanced compilers, which were made available on the 9.0-based systems, will be available again on 10.0. The compilers can give a 10 to 20 percent performance improvement.

Memory mapped files and dynamic buffer cache, previously available on the Series 700, are now available on the Series 800 platform. Both workstation and server platforms will now have software disk striping for improved I/O performance.

HP plans to move from the current HP-UX directory layout to the new SV.4 file system directory layout, the de facto industry standard. HP also will move from the HP-UX diskless implementation to the industry's de facto multivendor diskless standard. New features from NFS 4.2 and support for 4-byte EUC also will be provided in 10.0. In addition, a SPEC 1170-enabled HP-UX environment is scheduled for the end of 1995.

Significant enterprise management features have been added. With 10.0, SAM provides "administrator roles," where the lead administrator customizes individual SAM implementations for other administrators who do not need superuser capabilities. This allows for improved security and customization.

Other enhancements include the simple configuration of disk printers in the kernel. Enhanced password management and login restrictions are also featured.

New high availability features, LVM enhancements, and HP-UX Memory Page Deallocation are also offered.

Manufacturing Software for SYBASE

Avalon Software has announced Avalon CIIM 9.0 for SYBASE, which delivers new applications for shop floor control and capacity resource planning; new core functionality enabling demand-driven procurement and repetitive manufacturing; and enhanced financial applications to support multinational manufacturers and distributors.

Avalon CIIM is said to be the only manufacturing solution to provide native support for both ORACLE and SYBASE, a client-server architecture, computer-aided software engineering (CASE) tools, and a wide range of hardware and operating platforms.

The new Shop Floor Control module enables manufacturers to fully control and monitor both internal and subcontracted production activities. It is tightly linked to Avalon's Procurement module, enabling manufacturers to automatically generate requisition orders for parts and services. The new Capacity Resource Planning (CRP) module enables customers to evaluate the impact of released and recommended orders against current and future production resources.

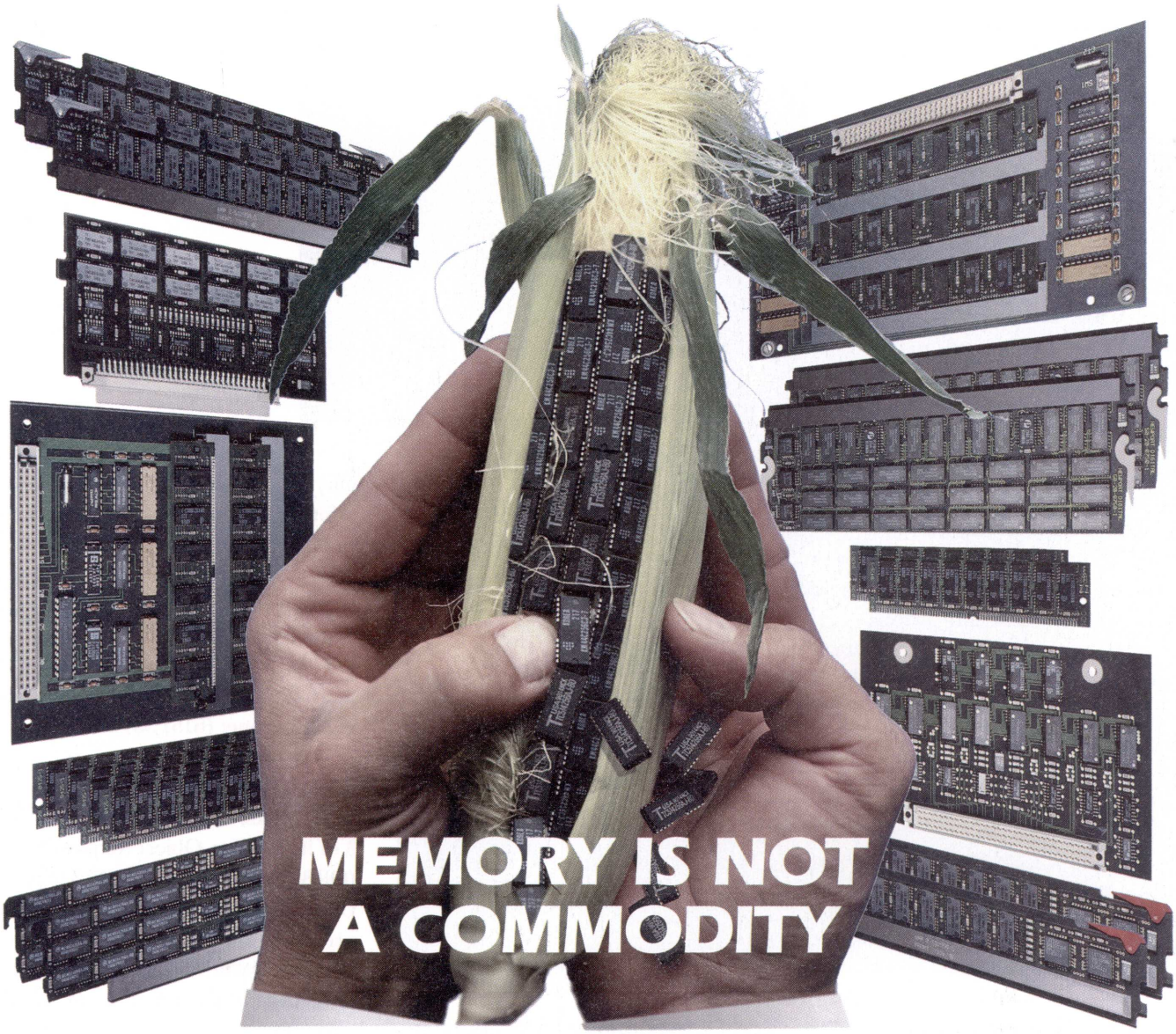
Customer orders and low inventory levels can trigger automatic inventory purchases and other procurement functions. Avalon has enhanced the Accounts Receivable, Accounts Payable, and General Ledger modules to provide expanded multicurrency capabilities, as well as a new global-oriented accounting functionality.

Prices range from $75,000 to $750,000 depending on hardware configuration, number of users, and modules purchased.

Contact Avalon Software, 3716 East Columbia, Tucson, Arizona 85714-3414, phone: (602) 790-4214, fax: (602) 750-0822.

Education, Non-Profit Administration

Datatel Incorporated has announced a formal partnership with Universal Algorithms Inc. (UAI) to sell its SCHEDULES25, 25E, and MODEL25 high-powered modeling tools for space



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HP-330/350/370			●		●						
HP-332			●								
HP-340			●								
HP-345/375/380			●	●			●	●			
HP-360			●	●	●		●				
HP-362		●	●	●							
HP-382			●	●			●				
HP-400/425/433			●	●			●	●			
HP-425E			●	●			●				
HP-700RX	●	●	●	●							
HP-705/710				●			●	●			
HP-715/725			●	●			●	●	●		
HP-720/730/735							●	●	●	●	
HP-742/745/747			●	●			●	●	●		
HP-750/755							●	●	●	●	●
HP-8X7/9X7							●	●	●	●	●
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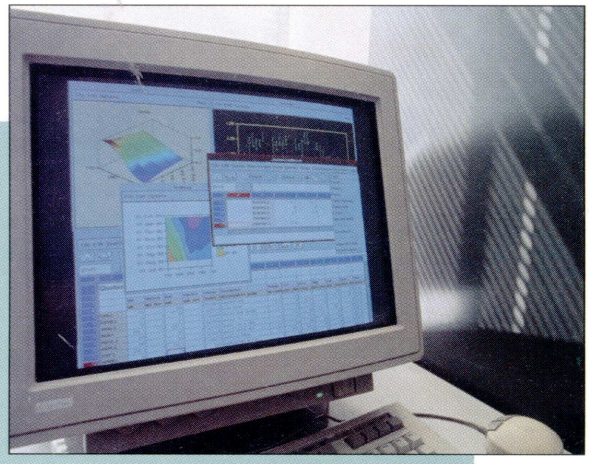

Applied Information Systems XESS 3.0

Client-Server Spreadsheet

Applied Information Systems has announced XESS 3.0, a spreadsheet product that includes an enhanced user interface for worksheets, graphs, and charts, plus full WYSIWYG support for display and printing, improved performance, and over 100 additional functions.

XESS is a customizable spreadsheet for X Windows that is easily combined with other applications. The XESS connections API toolkit supports application-specific add-ins and tight integration with other applications.

XESS is a real-time product capable of sending and receiving data and commands from other X Windows programs and of automatically recalculating the affected worksheets and graphs.

The product can augment the standard spreadsheet operations with functions for matrix operations, Fourier transforms, multiple regressions, linear equation solving, and advanced statistics. Users can build basic graphs with a single selection and mouse click and use colors and shading. Graph types include bar, line, scatter, *x-y*, polar, pie, histogram, high-low, contour, and 3D surfaces. When used for real-time applications, graphs change automatically as the input data changes.

Contact Applied Information Systems, Inc., 100 Europa Drive, Suite 555, Chapel Hill, North Carolina 27514, phone: (919) 942-7801 or (800) 334-5510, fax: (919) 493-7563.

planning and scheduling into Datatel's current and future client base.

Datatel's specialized applications include Colleague for Student, Human Resources, Financial, and Alumni & Development administrative systems management; Benefactor for advanced fund-raising management in higher education and non-profit organizations; and a CASE tool.

UAI's specialized applications offer automatic bulk classroom scheduling; online, multiuser course and event scheduling; and point-and-click graphic modeling.

Each partner's products run on multiple hardware platforms, including HP 9000s.

Contact Datatel, Inc., 4375 Fair Lakes Court, Fairfax, Virginia 22033, phone: (703) 968-9000.

COBOL Programmer's Workbench

Zortec has announced its COBOL Programmer's Workbench, which includes several components to help RMCOBOL programmers working in a UNIX environment reduce time spent on routine chores. The workbench includes a data inspector that allows browsing of formatted database records with access by any key and any value of that key. Data is displayed in hexadecimal and ASCII. A "byte mechanic" extends these capabilities to allow modification of data in hexadecimal format. Users can edit down to the byte level, regardless of data type.

The full-screen editor is designed to be easy to use. Editing functions can be assigned to any keys desired. In addition, a comprehensive file manager called Ztree is included. Ztree lets a user copy, delete, rename, print, view, compress, and edit files without using the UNIX command line.

A ZQL (Zortec Query Language) with data dictionary repository lets users obtain instant information on the contents in any file without writing a COBOL program.

The Zortec COBOL Programmer's Workbench, complete with all components, is $2,495.

Contact Zortec International, 1321 Murfreesboro Road, Nashville, Tennessee 37217, phone: (615) 361-7000.

Object Request Broker

I-Kinetics, Inc. has announced Release 3 of its I-Bridge Object Request Broker (ORB), said to be the first ORB to deliver UNIX applications, databases, services, utilities, and files as OLE objects to Microsoft Windows-based applications; to include object adapters to popular databases; and to include high-level access services that are identical for different sources. The I-Bridge ORB is optimized for retrieving data from various UNIX data resources. The ORB is distributed, with one part executing on Windows and providing services to Windows-based applications, and a second part executing on a UNIX host, along with object adapters to different types of data sources. The ObjectPump is a general-purpose adapter for accessing UNIX applications, services, utilities, and files, and redirects their output to the requesting Windows-based application. Specialized object adapters are available for Ingres, Oracle, and Sybase.

DDE and DLL interfaces are also available for PowerBuilder, Lotus 1-2-3, or any other Windows-based application that does not yet support OLE Automation.

CHANGE OF PLANS !

Change to Plan-B for host-based client/server PC network backup

	Plan-A (THE OLD WAY)	PLAN B
Completeness	"We only back up our PC servers. We don't worry about data on users' PCs."	"Plan-B backs up all our PCs and PC servers, or whichever PCs we specify."
Automation	"Users perform their own backups. We give each one a box of floppy disks and they come to us when they need more."	"We used Plan-B's scheduler to automatically back up our PCs to our HP9000's DDS drive at night."
Convenience	"We have someone who comes in at night and carries a Trakker to each PC and backs them up one-by-one during the night. Users fill out a form if they need a file restored, and our night person restores the file."	"Plan-B backups are done with no user or operator intervention. The PC data is written to tape as part of our HP9000 backup. Users have a program on their PCs which they use to restore any file, any time, in seconds."
Control	"Users are supposed to back up their own PCs. We tell them to put important files on the file server anyway."	"Plan-B meets our auditor's requirements for ensuring that all corporate data is safeguarded."
Integrity	"We are not concerned about data consistency between PCs and the HP9000. Our client/server applications have not been implemented yet."	"Plan-B is the only backup package we found that supports our client/server environment, in which interrelated data is contained on PCs and the HP9000."
Security	"Users keep their backup diskettes in their desk drawers."	"With Plan-B, our PC backups are as reliable and secure as our HP9000 backups."
Performance	"PCs with large disk drives can take a very long time. We tried doing a PC network-based backup but it was way too slow."	"Plan-B's speed blows everything else away, since it uses the horsepower of our HP9000 system and backs up multiple PCs concurrently."

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fax 34 65 54 101	fax 40 25 16 52	fax 30 852 70 35	fax 2 33 41 23 33	fax 0 638 445	fax 372 360305	fax 227-6867

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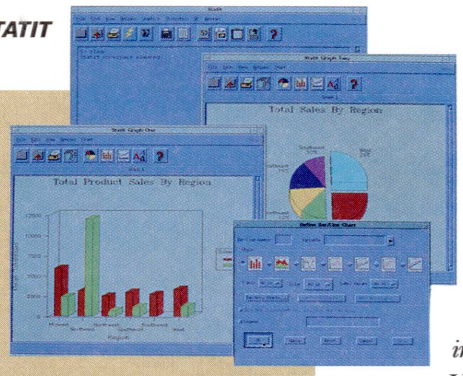
Statware, Inc. STATIT



Statistical Software

Statware, Inc. has introduced an OSF/Motif version of its statistical and graphical analysis software, STATIT.

Highlights of the user interface include the ability to display multiple graphic windows for different views of a dataset and continual access to all graphs produced during a work session, a spreadsheet-style window for easy data viewing and editing, online hypertext help for quick and convenient reference, user-configurable "smart buttons" for task shortcuts, pull-down menus with function descriptions, and tear-off menus that remain open for frequent use.

It offers statistical process control capabilities for manufacturing, time series and forecasting for finance, a broad range of statistical routines to analyze experimental data for engineering, and company-wide, 3-D perspective graphics, report writing capabilities, and easy access to data.

STATIT is available for HP 9000s direct from Statware, Inc. Pricing begins at $895 for a floating license. A free demo version is offered.

Contact Statware, Inc., 260 SW Madison Avenue, Corvallis, Oregon 97333, phone: (503) 753-5382, fax: (503) 758-4666, e-mail: *info@statware.com.*

I-Bridge also includes simultaneous data retrieval from multiple sources. It offers easy installation and high performance by eliminating extra database-specific drivers and communications products on the PC, SQL transparency so that all vendor-specific SQL extensions are supported, dial-up and mobile operation, and generation and collection of performance statistics to support system optimization.

Release 3 with a Starter Kit containing one UNIX ORB and two Windows-compatible ORBs is priced at $995. Customers have the option of including with the UNIX ORB one of the database object adapters or the ObjectPump.

Contact I-Kinetics, Inc., 19 Bishop Allen Drive, Cambridge, Massachusetts 02139, phone: (617) 661-8181, fax: (617) 661-8625, e-mail: *ahirsch@i-kinetics.com.*

Metrix Oracle Integration

Metrix has announced that Oracle has inducted Metrix into its Cooperative Alliance Initiative (CAI) program, highlighting Metrix' OpenUPTIME service management software as a "best of breed" application in the customer service industry. As part of the CAI program, Oracle will create interfaces from the OpenUPTIME Field Service, Support Desk, and Repair Center applications to the Oracle Cooperative Applications product suite.

Oracle Cooperative Applications are integrated enterprise-wide packaged applications that support a wide range of business-critical functions including financials, manufacturing, distribution, human resources, and project control operations. Metrix will work cooperatively with Oracle's Design and Migration Services organization to reinforce existing interfaces between OpenUPTIME and Oracle cooperative applications.

Contact Metrix, Inc., 20975 Swenson Drive, Waukesha, Wisconsin 53186-4064, phone: (414) 798-8560, fax: (414) 798-8573.

Development Environment for TUXEDO

JYACC, Inc. has announced JAM/Transaction Processing *interface* (JAM/TP*i*) for TUXEDO Version 1.0. JAM/TP*i* for TUXEDO integrates the user-interface and relational database capabilities of JAM with the distributed OLTP capabilities of TUXEDO. JAM/TP*i* provides for simple construction of both client and application server components.

Novell's TUXEDO is the leading distributed OLTP system in the UNIX market. It provides a high level of fault tolerance for distributed applications; detail processing control, such as load balancing, job prioritization, and asynchronous execution; application partitioning, allowing dynamic redistribution of application components; database independence; enhanced security and access control; and mainframe connectivity.

No knowledge of the TUXEDO API or of C programming is required, and the JAM/TP*i* methodology is comparatively simple. It constructs both TUXEDO clients and TUXEDO servers and supports the critical features of TUXEDO, including FML buffers for communications with non-JAM/TP*i* clients and servers.

Contact JYACC, Inc., 116 John Street, New York, New York 10038, phone: (212) 267-7722, fax: (212) 608-6753.

Customer Database/Document Management

Group 1 Software has announced Label Printing Plus, EZ-CASE Plus, and Merge/Purge Plus for the HP 9000, HP 3000, and other computers. These systems were previously available only for use with IBM and compatible mainframe and midrange computers.

Label Printing Plus lets a user print from 1-up to 9-up customized mailing labels of almost any size without custom programming. The size of each label and distance between labels can be specified, and up to 12 lines per label can be printed. The system accepts an input record of virtually any length or format, and allows users to include seed names for tracking purposes.

EZ-CASE Plus is a callable subroutine that uses algorithms and system tables to case and punctuate virtually any type of data, including individual and company names, job titles, and addresses, prior to printing.

Merge/Purge Plus detects and eliminates duplicates within a single file or across multiple files. It is designed to identify duplicate names and addresses even when there are variations or misspellings in the name and address components. The system can process up to 200 different list codes. It produces detailed reports, list comparisons, and statistics.

Label Printing Plus lists from $2,000 to $5,000, EZ-CASE Plus lists from $5,000 to $10,000, and Merge/Purge Plus lists from $10,000 to $20,000. Prices vary according to the number of records passed through the system. Annual maintenance programs are available. Label Printing Plus, EZ-CASE Plus, and Merge/Plus Plus are available on 4-mm and 8-mm cartridge.

Contact Group 1 Software, 4200 Parliament Place, Lanham, Maryland 20706-1844, phone: (800) 368-5806, ext. 383.

Full-Screen Editor

Robelle Consulting has enhanced Qedit for HP-UX, its full-screen editor for HP-UX programmers. Qedit/UX is

Storage Server

Dallas Digital, a Tripac Systems Incorporated company, has announced agreement with Fujitsu Computer Products of America, Inc. to distribute and support Fujitsu's DynaSERVE network storage management server.

DynaSERVE incorporates four data storage technologies into one server. With advanced storage management software, redundant array of independent disks (RAID), and optical and tape libraries, DynaSERVE delivers a high level of data integrity at storage capacities. It can store up to 40 GB in the optical library, 8 GB on RAID, and 255 GB in the tape library. The server's preinstalled storage management software is the Fujitsu Storage manager. Online storage is performed by the Fujitsu DynaRAID, and near-line storage is provided by the Hewlett-Packard 40T optical jukebox. The backup storage technology is the StorageTek 9708, 8-mm helical scan tape library. DynaSERVE supports UNIX-based workstations and up to 100 DOS, OS/2, and UNIX personal computers.

Initial setup of DynaSERVE is accomplished through the system's point-and-click commands. After configuration, the server provides transparent, automated data migration of seldom-used or unused files from the online RAID system to the more economical storage media.

DynaSERVE is available from Dallas Digital, which provides system integration and warranty support. The server's list price is $190,000.

Contact Dallas Digital, 5215 North O'Connor, Suite 200, Irving, Texas 75039, phone: (214) 432-3550, fax: (214) 869-4550.

modeled on Robelle's Qedit editor for MPE, which for years has provided a complete development environment for programmers. Qedit/UX offers the same friendly look and ease of editing as its MPE counterpart, the company notes.

Once inside Qedit, users can run programs and execute shell commands (Qedit knows which shell is preferred) and shell scripts. In addition to its full-screen mode with cut-and-paste, Qedit has a command mode for editing files interactively or in shell scripts. Qedit 4.3 for HP-UX features the handling of large text files and support for the *cd* command, Reflection functions, and tab characters.

Users can edit text files of virtually unlimited size in Qedit. The new workfile format allows files to be up to 99 million lines long and 1,000 characters wide. Qedit also remembers the previous context (including current line and filename) when files are shut and then reopened.

Qedit for HP-UX comes with an up-to-date user manual and complete online help. Free evaluation copies are available.

Contact Robelle Consulting Ltd., Unit 201, 15399-102A Avenue, Surrey, B.C., Canada V3R 7K1, phone: (604) 582-1700, fax: (604) 582-1799, e-mail: *info@robelle.com*.

New From Scopus Technology, Inc.

Contract Management

Scopus Technology, Inc. has announced ContractTEAM, the newest module of the ProTEAM customer information management system. ContractTEAM allows users to create, implement, and manage direct and third-party service offerings. The ContractTEAM module gives service providers easy access to information regarding contract terms and conditions, installed base, service history, and other information needed to manage service agreements.

ContractTEAM automates the creation of a new service agreement and the updating or renewing of an existing one. It also provides a mechanism to quickly determine a customer's service status for approval in real time. In addition, it gathers information from the SupportTEAM customer support module regarding services delivered.

The system tracks the performance of service-providing subcontractors, enabling the cost and delivery of these services to appear transparent to the customer. It helps to automate verification of the third-party invoice against a service agreement, to determine geographic service availability information, and to establish various types of customer and third-party relationships.

ContractTEAM is sold per concurrent user. An implementation for 10 users on a single server costs approximately $50,000, depending on the configuration. ContractTEAM was scheduled to ship before year end on all supported ProTEAM platforms, including HP-UX workstations.

Help Desk

Scopus Technology has announced ProTEAM for the Help Desk, a combination of ProTEAM modules designed to meet the needs of large-scale internal help desk operations. Three new modules, NetTEAM, AssetTEAM, and TeleTEAM, have been added. The offering also includes the SupportTEAM 3.5 call tracking application.

AssetTEAM allows the help desk to collect, store, and easily retrieve information about each user's installed product. Using local agents as an interface between network and systems management software and the ProTEAM

Visual Tool

Visix Software Inc. has announced the Galaxy Visual Builder Integration Kit, which enables developers to customize and extend the Galaxy Application Environment. Galaxy is a cross-platform development environment designed for creating scalable, mission-critical applications that are graphical and distributed. The Visual Builder Integration (VBI) Kit is the first Galaxy add-on product offered by Visix.

The VBI Kit is targeted at developers who modify, extend, or build new Galaxy objects, allowing them to create specialized object editors that can be tightly integrated into the Galaxy Visual Resource Builder. The VBI Kit can be used to tailor the Galaxy visual tools.

Developers can create and integrate specialized visual editors into the Galaxy Visual Resource Builder, allowing the developers to work with custom and special-purpose objects without leaving the Galaxy visual programming environment. They can also modify standard Galaxy editors to operate on extended Galaxy objects within the Visual Resource builder. They can replace Galaxy visual editors tailored to corporate objects or modify the functions of standard Galaxy visual editors to ensure that objects are used consistently across development groups.

The VBI Kit will be available directly from Visix and is priced at $4,995. Galaxy is available for UNIX (including HP-UX), Microsoft Windows, Windows NT, OS/2, and Open VMS. The C version is priced at $9,600 per developer seat, with no run-time fees. Galaxy/C++ is priced at $12,100 per developer seat, with no run-time fees.

Contact Visix Software Inc., 11440 Commerce Park Drive, Reston, Virginia 22091, phone: (703) 758-8230 or (800) 832-8668, fax: (703) 758-0233.

database, NetTEAM accepts and screens network event information from SNMP management products such as HP OpenView, IBM NetView AIX, and Sun NetManagement. TeleTEAM is designed to support both inbound and outbound telephone services (e.g., ANI and DNIS) and systems (e.g., PBXs, ACDs, IVRs, and predictive dialers).

Help Desk users have the ability to generate and track a series of subtasks associated with a call. All ProTEAM modules also leverage a knowledge-based system and use keyword searches, Boolean logic, and relevance ranking.

The RemoteTEAM module enables users in a global operation to log inquiries and determine their status 24 hours a day, 7 days a week, with no human intervention.

AssetTEAM, NetTEAM, TeleTEAM, SupportTEAM, and RemoteTEAM are priced separately and are sold on a per concurrent user basis. An implementation for 10 users on a single server costs approximately $50,000, depending on the configuration.

Contact Scopus, 1900 Powell Street, Emeryville, California 94608, phone: (510) 428-0500, fax: (510) 428-1027, e-mail: *cpadnos@scopus.com.*

VLDB Consultancy

Former Oracle Consulting principals James W. Kao, Mark Hwang, and Alex Kim have left Oracle Corporation to form a consultancy to help companies with very large databases, or VLDB (50 GB or more), move from mainframe to open systems environments. The company has also established strategic relationships with HP Professional Services and Sun Integration Services to work jointly on rightsizing projects.

The RightSizing Group architects have 50 years of combined UNIX experience, including 25 years of combined Oracle and other RDBMS experience. Past engagements include Wells Fargo Bank, Mervyn's, Duke Power, Colgate-Palmolive, CitiCorp, VLSI Technology, Internal Revenue Service, SunSoft, and Fidelity Investments. More than 90 percent of past engagements involved databases of more than 50 GB.

The RightSizing Group offers start-to-finish information systems consulting that takes businesses from planning and system design to implementation. Value-added services include project management advisory services, enterprise information system reengineering, an architecture roadmap program, capacity sizing and stress testing, open systems implementation assistance, backup and recovery strategy, legacy data extraction, and database and system administration services and apprenticeship.

Contact the RightSizing Group, 3130 La Selva, Suite 303, San Mateo, California 94403, phone: (415) 525-3700, fax: (415) 525-3707, e-mail: *info@rightsizing.com.*

Software Analysis

ASTA, Inc. has announced The Safe C Runtime Analyzer, a new automated software analysis and test system designed to improve the quality and performance of C programs. The analyzer is used by software development and test organizations to detect run-time errors, identify test coverage and performance bottlenecks, and understand program control flow. Safe C provides software developers the ability to thoroughly analyze and test software programs during the development process.

It quickly identifies difficult-to-detect

run-time errors such as memory leaks, dangling and uninitialized pointers, static and dynamic array boundary errors, stray pointers and out-of-bounds indices, arithmetic overflow and division by zero, and mismatches of formal and actual parameters in function calls. Error messages are automatically reported with clear and concise explanations of the problem and the source code line number where the deficiency arose.

Safe C also indicates the execution frequency for each function and statement in the program and identifies statements that have not been executed. Dynamic tracing provides developers the ability to view the behavior of their programs during execution by displaying a complete execution history, including function calls and assignments to variables.

Safe C is available on all popular UNIX and NT platforms. License prices start at $1,200.

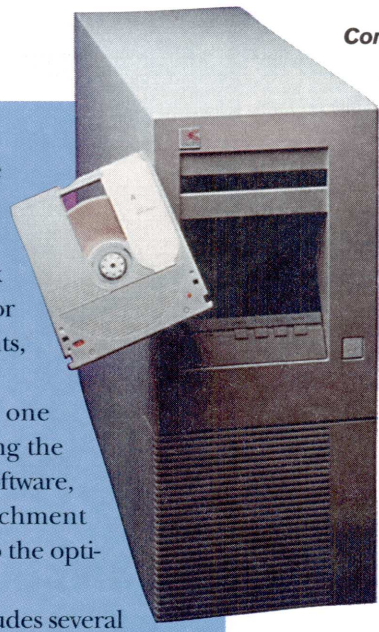
Contact ASTA, Inc., 1 Chestnut Street, Suites 205/206, Nashua, New Hampshire 03060, phone: (800) 350-2782 or (603) 889-2230, fax: (603) 881-3740.

Job Accounting

UniSolutions Associates has announced Version 2.2 of UNISOL JobAcct, which now provides complete system monitoring, resource accounting, and billing solutions. The system performance monitoring option collects and summarizes data in graphical and tabular form for viewing on ASCII terminals, X-window system displays, and for output on laser printers.

Wildcards may be used when configuring user project files. The disk accounting subsystem can ignore NFS-mounted directories or perform accounting only for local file systems.

The system performance monitoring



Concorde Technologies, Inc. QuickConnect Model 20

LAN Jukebox

Concorde Technologies, Inc. has announced the QuickConnect Model 20 Optical LAN Jukebox, a complete direct-network-attachable 20-GB optical storage solution that offers easy-to-use online archival storage. The new jukebox connects easily at any place on the network. The product is for UNIX system-based network file system (NFS) environments, such as networks of HP 9000s.

The QuickConnect Model 20 typically takes less than one hour to install and does not affect network operation during the process, the company notes. All installation hardware and software, including a 340-MB magnetic hard disk, direct-LAN attachment hardware, and jukebox-management software, are built into the optical jukebox unit.

The QuickConnect Model 20 Optical LAN Jukebox includes several data management features specifically developed for efficient network operation: data directories reside on the built-in hard disk for enhanced performance; the hard-disk cache stores frequently used files, making requests fast and efficient; and additional storage capacity looks like one big disk to the network. The jukebox is manageable from any terminal on the LAN via Telnet. It can be accessed and managed from any client using NFS, from UNIX workstations and servers to PCs, Macintosh computers, or mainframes.

The Concorde Technologies QuickConnect Model 20 Optical LAN Jukebox for NFS is $12,500 and is immediately available.

Contact Concorde Technologies, 6370 Lusk Blvd., Suite F100, San Diego, California 92121, phone: (619) 458-0702, fax: (619) 458-0722.

option monitors system activity and collects system performance data for summary in daily reports. Data may be analyzed on-screen or printed. All system performance data may be kept online for months or archived to tape. UNISOL JobAcct can perform actual cost accounting and chargeback for each user, group, project, and cost center, or proportional chargeback on a project/department level.

It supports variable rate structures and accounting periods and provides flexible report formats and direct billing charge statements. Users may allocate charges to multiple projects during a login session and can review their previous charges from online summary reports. Reports can be generated for a single host or for multiple machines on the network.

License fees for the base accounting package range from $1,595 to $6,000 for master copies and $300 to $1,500 for collector copies. The performance monitoring module license ranges from $195 to $895. UNISOL JobAcct is available immediately on HP-UX 9.03 and other UNIX variants.

Contact UniSolutions Associates, 2103 Mathews Avenue, Suite 1, Redondo Beach, California 90278, phone: (310) 542-0068, fax: (310) 370-4024.

Client-Server Warehousing

Cambar Software has announced the Client-Server Warehousing (CSW) software system on the HP 9000 platform.

CSW is designed to fully automate all major warehouse functions, including receiving and putting away, order pooling, picking and shipping, inventory control, cycle counting, physical inventory, bin replenishment, and report generation. It features graphical screens, RF/barcode scanning, real-time information delivery, and 24-hour operation support that makes it possible for the warehouse to keep functioning even if the host distribution system goes down.

Price ranges from $150,000 to $300,000, depending on configuration and customization.

Contact Cambar Software, 4975 LaCross Road, Charleston, South Carolina 29406-6524, phone: (803) 747-4900, fax: (803) 554-2970.

CAD Geometry Tool

Imageware, Inc. has announced Version 4.0 of Surfacer, which provides an icon-based interface with powerful tools for point processing, geometry creation, and verification. Surfacer allows engineers and designers to quickly and accurately recreate or verify complex CAD geometry from physical parts, models, and prototypes. It features direct inputs of digitized points from CMMs, laser, vision, and touch probe digitizing systems.

Curve and surface editing may now be accomplished by directly manipulating the geometry. Surface editing now includes real-time feedback. Compressed files can be imported and exported directly from Surfacer, without using additional filters.

Online help and an option for displaying surfaces as a curve mesh have been added. The boundaries and internal mesh of the surface are now displayed at "near pixel" level accuracy. Surfacer

Sign up NOW for Fall 1995 Listings

hp-ux/resource directory

The *hp-ux/resource directory* is a complete resource guide for HP-UX users seeking answers. This is one of the industry's most extensive reference guides for HP-UX products, services, and vendors. It will be devoted entirely to HP 9000 users operating in multi-user, workstation, and multi-system UNIX environments. This bi-annual directory, published each year in March and September, is a separate publication mailed out with *hp-ux/usr* magazine, the only HP-specific publication on the market.

Each company is listed by category, with each listing including company name, product, operating environment, and phone number. The cost for a full year listing in the *hp-ux/resource directory* is $475. Discounts are available for current advertisers in *hp-ux/usr, Interact* or the *Vendor Service Source Directory*. Advertisers who run more than one listing per issue also receive a discount. There is a 75-word maximum per listing, with a charge of $1.00 per word over the maximum.

The Fall 1995 *hp-ux/resource directory* will be published in **September** with **all listings *due* by May 5, 1995.** For further information contact Liana Fisher at the Interex Advertising Department 408.747.0227 or 800.468.3739. Fax: 408.747.0947. Written inquiries should be addressed: Liana Fisher, Interex, 1192 Borregas Avenue, P.O. Box 3439, Sunnyvale, California 94088-3439 U.S.A.

Product Categories

Accounting
Accounting Software
Application Development Software
Application Development Tools/4GL
Application Software Design
Backup Hardware
Backup Software
Bar Code Data Collection Systems
Batch Job Management
Business Software
CAD Software/Hardware
Case Tools
Change Control
Change Management Tools
Civil Engineering
Client-Server
Communications
Communications Servers
Communications Software
Consulting
Consulting/Systems Integration
Customer Support/Help Desk Systems
Database Management Systems
Database Management Tools
Data Center Management
Data Warehousing
Decision Support Systems
Depot Repair/On-Site Management
Desktop Publishing
Disaster Recovery
Disk Drives
Distribution Software
Document Management
Electronic Data Interchange (EDI)
Electronic Form Printing
Electronic Mail and Directory Integration
End-User Computing
Executive Information Systems
Fax Automation
Financial
Font Creation and Manipulation
Fourth Generation Language
Full-Screen Editor
Government
Graphics
Hardware
Hardware/Mass Storage
Hardware Subsystems
Help Desk Management
Hierarchical Storage Management
Human Resources and Personnel Systems
Image Processing
Image Storage and Retrieval Management
Industrial Terminals
Instrument Control
Integration Tools
I/O Boards
Job Scheduling and Workload Management
Laser Printers
Laser Printing Software
Local Area Network (LAN)
Mail Management and Marketing
Maintenance
Manufacturing
Manufacturing Software
Mass Storage
Math Libraries
Memory
Memory Upgrades
Migration Tools
Multimedia
Municipal Software
Network Backup Software
Network Integration
Network Management
Networking
Networking Systems
Operating System
Payroll
PC Integration
Performance
Performance Software
Personal Information Manager
Personnel Management
Pointing Devices
Pre- and Post-Print Automation
Print Management
Process Control Software
Project Management
Protocol Converters/Interfaces-Hardware
Publications
Purchasing
Quality Assurance Tools
Records Management
Remote Control Software
Rentals
Report Viewing, Printing, and Distribution
Report Writers
Resource Management
Sales and Marketing
Scheduling
Scheduling/Task Management
Security
SNA Communications
Software
Software Development-Parametric
Software Development Tools
Software Maintenance and Testing
Spoolers
Statistics
Statistics/Data Analysis
System Integration
System Management
Tape Backup Products
Tape Storage
Tape Storage/Data Interchange
Technical Documentation/Cross Referencing
Telephone Management
Terminal Emulation
Text Editors
Time and Billing
Time Reporting Terminals
Training
User Groups
Utilities
Workstations

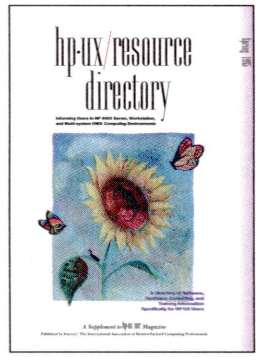
Other categories may be created as needed.
See reverse side for listing form

Interex The International Association of Hewlett-Packard Computing Professionals

hp-ux/resource directory

FALL 1995 Listing Form

The Interex ***hp-ux/resource directory*** is published two times a year and mailed with *hp-ux/usr* magazine. **The cost for a single listing in two issues is $475.** Each additional listing is $375. Discounts are available for current advertisers in *hp-ux/usr, Interact,* or the *Vendor Service Source Directory.* For additional listings, please duplicate this form. The maximum number of words per listing is 75, excluding company name, address, product name, and operating environment. There is a charge of $1.00 per additional word for each listing. The fall 1995 ***hp-ux/resource directory*** will be published in **September** with **all listings *due* by May 5, 1995.**



Spring 1995 ***hp-ux/resource directory***

Company logos can be placed with listings. The cost is $100, with discounts available for multiple listings. Maximum size is 3/4 inches high by 1-1/2 inches wide.

NEW

Product photos can now be placed with listings. The cost is $100 per photo, with discounts available for multiple listings. There is a $75 charge for changing photos between issues. Photos must be submitted in either 35mm slides, 4x5 transparencies, or up to 4x6 **GLOSSY** prints (black and white or color). The actual size the photo will appear in the publication is 2 3/16" wide and the height will be determined by the orientation of the original photo (horizontal or vertical).

(Please fill in all information completely—**ONLY** typewritten or clearly printed copy will be accepted)

Category _____

Product Name _____

Operating Environment _____

Product Description (MAXIMUM 75 WORDS) There is a $1.00 per word charge for all listings over 75 words. If you need more space, please type or clearly print copy on a separate sheet and attach to this form.

Please return completed form to:

Interex ▪ 1192 Borregas Avenue, P.O. Box 3439, Sunnyvale, CA 94088-3439, U.S.A.
Phone (408) 747-0227 or (800) 468-3739 ▪ **Fax** (408) 747-0947

Company Name _____

Address _____

City _____ State _____ Zip _____

Phone Number _____ Fax Number _____

Authorization _____
Signature/Date

_____
Signature/Date

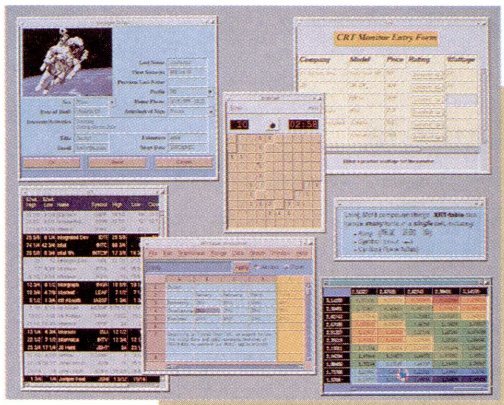
Terms & Conditions of Sale: All ads are under the terms Net 30 Days. Any balance over 30 days old will be charged 1.5% per month. Interex reserves the right to refuse advertisement in any of its publications to any delinquent advertisers.
Cancellations Clause: All cancellations must be made by the listing due date and must be followed in writing within 5 working days.

PAYMENT OR PURCHASE ORDER MUST ACCOMPANY ALL ORDERS

also features IGES, VDA-FS, DXF, OBJ, STL, and CADDS5 read/write capabilities; direct interfaces to over 25 digitizers, CMMs, and data formats; a macro language for writing scripts; and the Open Architecture Kit for creating customized applications.

An optional module for producing and manipulating polygonized shapes that can be used for rapid prototyping, the Surfacer Rapid Prototyping Module (RPM), also allows users to see their data files and verify the integrity of the model while checking for error conditions such as open volumes and redundant, degenerate, overlapping, and intersecting polygons.

Contact Imageware, 313 N. First Street, Ann Arbor, Michigan 48103, phone: (313) 994-7300.



KL Group Inc. XRT/table Version 2.0

Table Widget

KL Group Inc. has announced the release of XRT/table Version 2.0, a multipurpose widget that enables Motif developers to build interactive tables into their applications. The new version enhances developer productivity by enabling developers to quickly and cost-effectively create data-entry forms and editable scrolled lists. Also, for the first time, XRT/table is available for OpenVMS.

XRT/table Version 2.0 is available now. A single development license is $1,495; licensing for a network is $5,995. There are no run-time, royalty, or distribution fees.

XRT/table allows developers and end users to display and manipulate tabular data in OSF/Motif applications. New features of XRT/table include cells that contain other widgets and/or pixmap images for easy placement of buttons, menus, logos, and photos within a cell; cell spanning or joining neighboring cells to create the impression of a single large cell; a new widget, XRT/label, which supports text rotation and PostScript printing and can be used to display titles on any side of a table; and support for Motif 1.2 drag and drop, which allows end users to cut/copy cells and/or ranges of cells from one table to another.

XRT/table can be used in conjunction with other KL Group products, including XRT/graph and XRT/3d. All XRT products are based on the open object-oriented architecture used by the Xt Intrinsics and OSF/Motif. XRT products also support UIL and C++ interfaces and can be easily integrated into popular GUI building tools.

Contact KL Group, 260 King Street East, Third Floor, Toronto, Ontario, Canada M5A 1K3, phone: (416) 594-1026 or (800) 663-4723, fax: (416) 594-1919, e-mail: *info@klg.com.*

New from HP

CD Now Program

HP has announced it will migrate to the CD-ROM medium for software delivery to HP 9000 customers during the next three years. This program, CD Now, is part of a company-wide initiative to improve customer access to HP products and services. The three-year plan is designed to give HP workstation and business server customers and HP Channel Partners time to plan a smooth transition to CD-ROM. Currently, HP customers can order the HP-UX operating system and other HP software on CD-ROM or digital audiotape (DAT). After the program is complete, HP will offer DAT only on special request.

HP 9000 customers can purchase a CD set containing nearly all HP software, including HP-UX, CASE tools, and networking, system-administration, and database software for less than the price of HP-UX alone on DAT. When media-update costs are factored in with initial purchase prices, HP's CD-ROM-based software can save between $1,000 to $2,000 per system over three years.

Effective November 1, HP is reducing all HP 9000 CD-ROM media prices. For example, the CD-ROM media price for HP-UX 9.04 and associated software products for the Series 800 will be reduced from $630 to $520, and the price for Series 700 HP-UX 9.0 documentation on CD-ROM will be reduced from $835 to $695. HP also is reducing prices of CD-ROM drives to $655 (initial drives) and $875 (external drives) and will increase the prices of selected DAT media and paper documentation 10 percent to 30 percent. ◧

Attention vendors: New product announcements should be sent to New Products Editor, hp-ux/usr *magazine, Interex, P.O. Box 3439, Sunnyvale, California 94088-3439, USA.*

Deadline for submission is 2½ months prior to publication.

interex

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Membership Levels *and Service Packages*

The International Association of Hewlett-Packard Computing Professionals

Membership Levels

■ **associate level** includes the following services/benefits:

- **Subscription to either:**
  hp•ux/usr magazine - includes companion Product Directory
  Interact magazine - includes companion Product Directory
- Member rates for Interex Conferences
- Read-only access to Interex Online library
- Membership in your local Regional User Group (RUG) at RUG membership rate

■ **contributing level** includes the following services/benefits:

- **Subscription to BOTH:**
  hp•ux/usr magazine - includes companion Product Directory
  Interact magazine - includes companion Product Directory
- Subscription to *InterexPress,* monthly news publication
- E-Mail account through Interex (includes read-only access to Interex Online library)
- Access to Special Interest Groups (SIGs)
- Member rates for Interex Conferences
- Membership in your Regional User Group (RUG) at RUG membership rate
- Voting Privileges for Board Elections and Advocacy Surveys
  (i.e., system improvement surveys)

Service Packages

■ **online service package** includes ALL the benefits of Contributing Level plus:

- **Software Access**—unlimited downloads from entire library of HP-UX, MPE, and RTE programs (containing over 4,800 programs). Includes one free tape of current Interex Annual Release in the operating system of your choice. Custom tapes from software library are also available.
- **Information Access**—full text search and downloading capabilities for all Interex publications including: *hp-ux/usr, Interact,* Vendor Resource Directories, product news and announcements, and Conference Proceedings abstracts.
- **Member Access**—member directory. Find members with similar interests. Plus access to the *Who's Who* guide of Interex staff, volunteers, and HP liaisons.

Online services are continually upgraded and modified; services are subject to change without notice.

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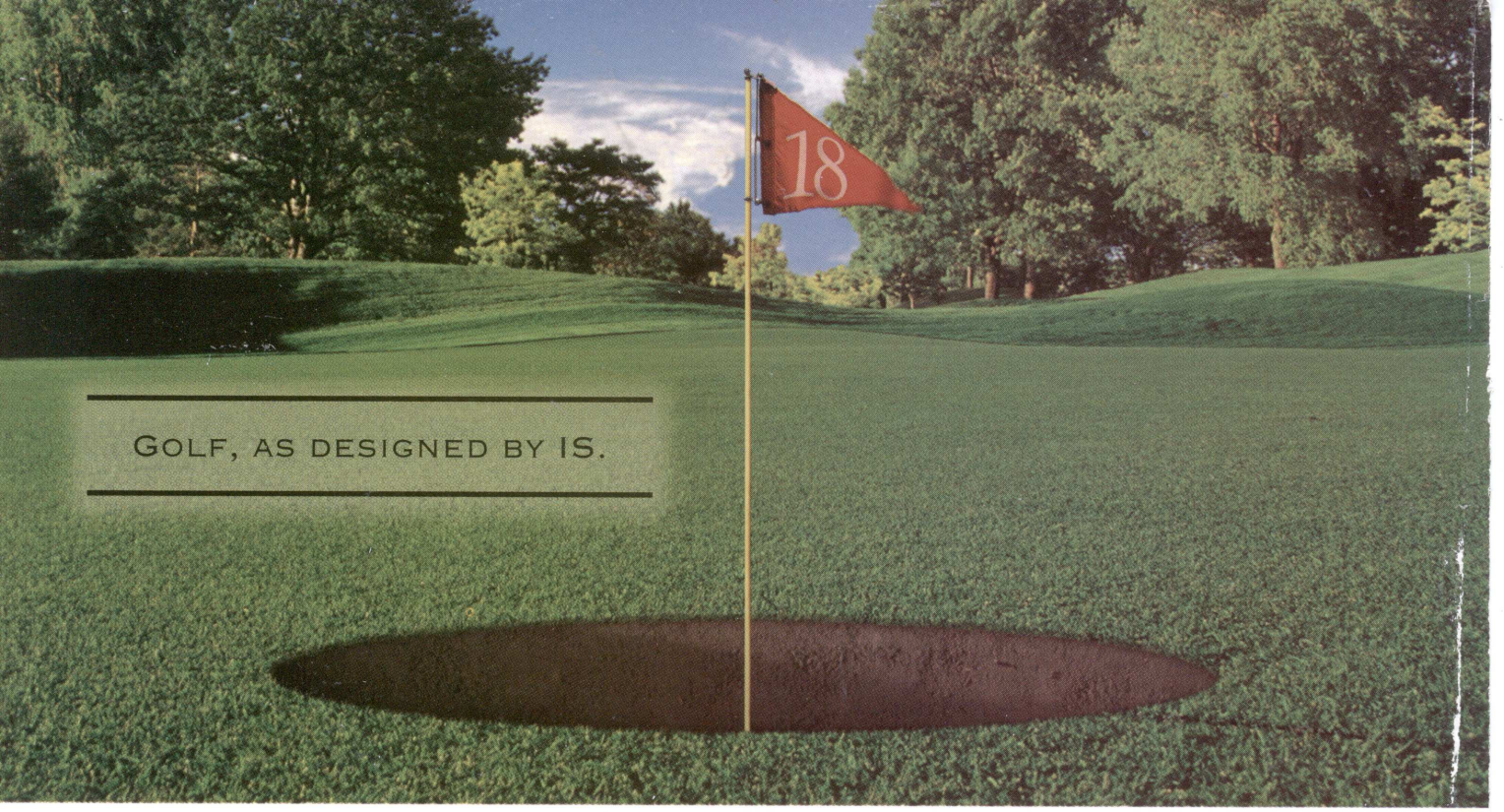

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